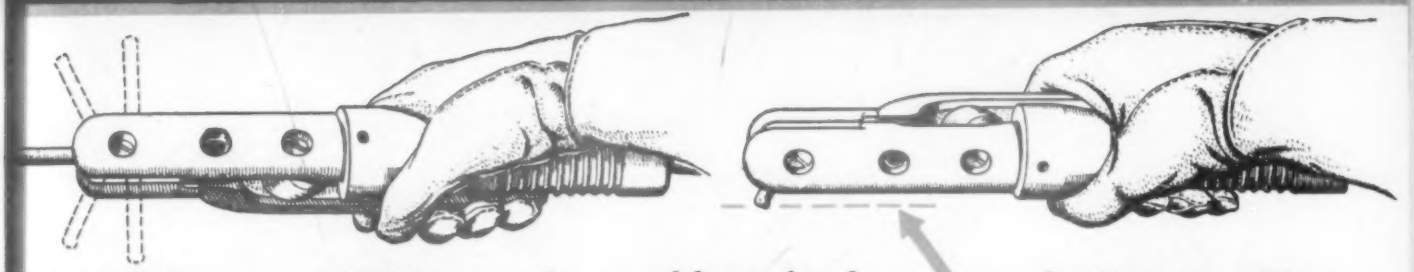
The Welding Engineer
SEPTEMBER, 1945
THE PIONEER TECHNICAL PUBLICATION OF THE WELDING INDUSTRY

Jackson's *Featherlight* A-4W



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More than Half a

Let This Be a Tribute to the Jeep: It fought with our fighting men wherever they went . . . in bitter cold and desert heat . . . through mud and over mountains . . . from the beaches of Normandy to the heart of Germany, and in Italy and the Pacific. No terrain was too rough, no assignment too tough, for this battle-scarred little veteran that won America's heart while it helped win its battles. The mighty jeep is part of history.

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Welded Reduction-Gear Cases

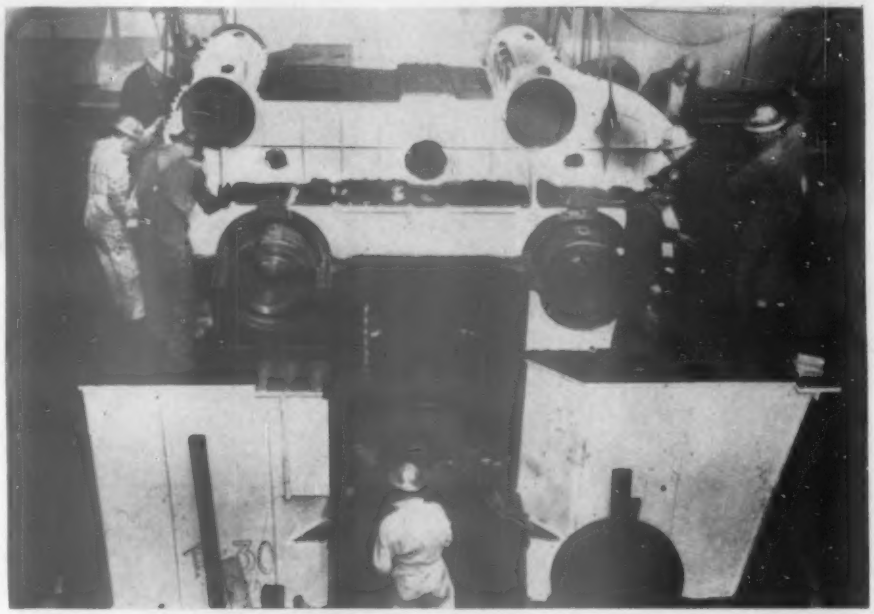
Waldrip Engineering makes 30 ton welded housings for 8,500 hp marine reduction gears. Welding positioners of 1½, 7 and 20 tons help to turn out a complete case a week with a crew of only eight fitters and weldors.

By C. E. SOMMARSTROM* and FRED M. BURT

THE term "weldment" has ever-growing maxima and minima, encompassing at one extreme intricate parts of the aircraft industry weighing only a few ounces and at the other the 10,000 ton ships of our merchant marine and navy. Typical of the weldments which combine precision *and* size are parts of ship machinery which have been adapted to a welded structure to gain increased strength, lighter weight, lower cost and faster production. Included are such items as propulsion reduction-gear housings, Diesel engines and miscellaneous reduction gears.

30 Ton Welded Housings

One of the relatively few firms doing this type of work, the Waldrip Engineering Co., Hollydale, Calif., each week produces a complete reduction gear housing weighing approximately 30 tons. These units are shipped via truck to the Joshua Hendy Iron Works, Sunnydale, Calif., a distance of over 400 miles. At the Hendy plant the double-reduction-gear housing units are machined and fitted with gears. The finished unit as installed in the ship (Fig. 1) transmits the 8,500 hp of the two turbines to the war or merchant's ship's propeller.



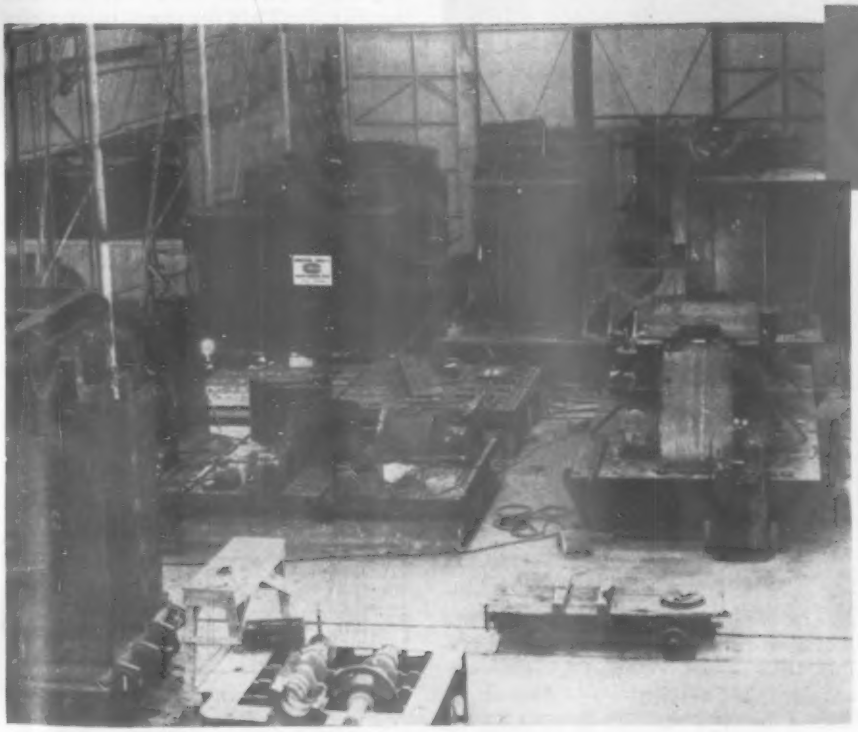


Fig. 1 (above)—An 8,500 hp double reduction gear unit being installed in an attack transport.

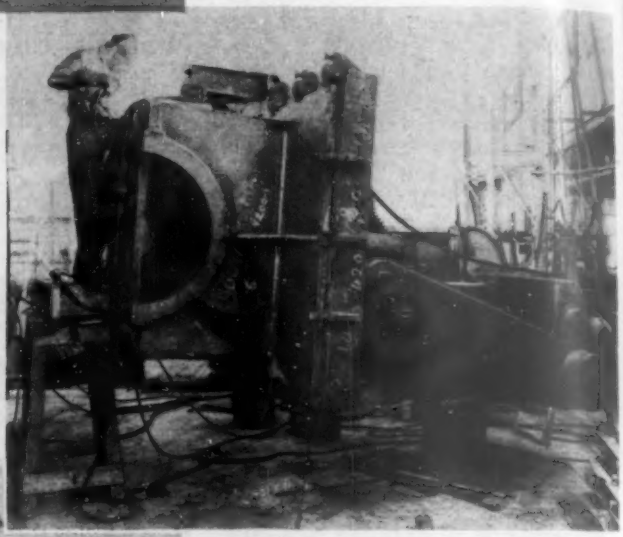
Fig. 2 (left)—Two completed cases awaiting shipment (extreme rear and rear left) and units undergoing final assembly operations.

At the Waldrip plant full use is made of the advantages of positioning the work to do the welding in a downhand position. The main case of the reduction-gear housing is too large for positioning, however, and so it is necessary to break the unit into a number of subassemblies. The case weldment (Fig. 2) is a boxlike structure approximately 18 ft long, 13 ft wide and 9 ft high, with an inner space that is about 12 ft long, 5 ft wide and 9 ft high. It is designed to take the load of the two second reduction gears (note the four top bearing seats in Fig. 2) and the main gear wheel, the bearings of which take the entire

*Engineering Manager, Waldrip Engineering Co.

Fig. 3 — First step in fabrication: flame-cutting the plate stock.

Fig. 5 (right, below) — Welding the main thrust bearing on a 14,000 lbs welding positioner.



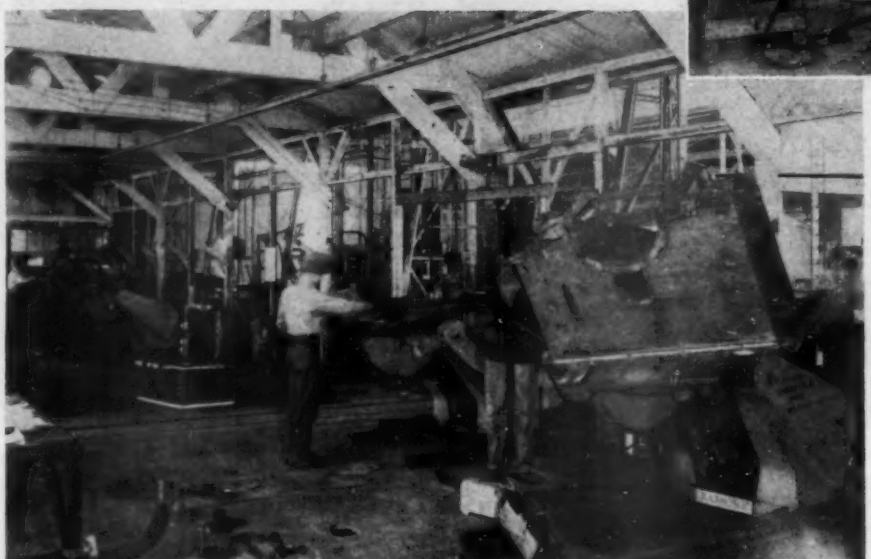


Fig. 4—Welding the rear main bearing on a 3,000 ton positioner.

thrust load of the ship. The pinion gears are supported by the case cover, which can be seen in Fig. 1.

Cutting and Forming

The entire unit is made from plate stock varying from the ⅜ in. thickness in the cell-type case walls to the 2 in. base plate and the 3½ in. plate used in the thrust bearing. All parts are first flame-cut to shape with either a pantograph-type or cross carriage shape-cutting machine (Fig. 3). Cutting is followed by flame-scarfing, machining and forming. The forming operation on the 1½ and 1¾ in. bearing shells is done cold on a 500 ton press brake.

After the parts have been prepared, work begins on the four major subassemblies of the case, the front and rear main bearings, and the right and left halves. The shells of the front and rear main bearings are subassemblies which are welded on 3,000 lb positioners. The complete rear main bearing is also welded on a 3,000 lb positioner (Fig. 4), but the heavier front bearing (thrust) requires a larger unit and is welded on a 14,000 lb positioner (Fig. 5).

Weld Sizes and Details

The welds include fillet and butt welds in practically all of these varying thicknesses of metal. For example, the vertical cell plates are joined by 1¼ in. fillets while 1 in. fillets are used in the assembly of the heavy plates which make up the main bearing seat. For most of these welding applications an AWS E-6020 type of electrode fills the bill.

On the butt welds, especially on the 2 in. thick bearing base plates, the weld is made against a backing strip. The vee has an included angle of 40 deg with a root spacing of ⅜ in. (Fig. 6). After the butt weld has been completed, the ⅛ by 1½ in. backing strip is removed; the weld is then back chipped and rewelded to insure complete fusion.

Pipe Jig for Case Halves

The right and left halves of the case are similar in design. A special jig was built for each half as shown in Fig. 7. This jig consists of a pipe structure welded to a surfaced strong-

Fig. 6 — Details showing various types of welds.

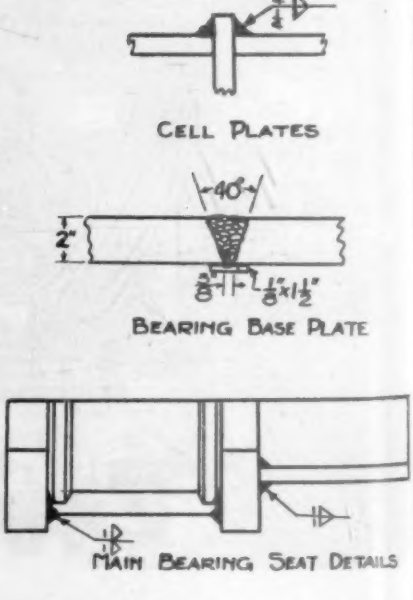


Fig. 7 (left) — Jig for assembly of left half of case with base plate in place. The right half is on The positioner shown in the background.

Fig. 8—Left half of case nearing completion on the 20 ton positioner.

back. A lighter, removable strongback is aligned to the base by plugs fitting into the top of each of the four pipe columns.

The assembly begins by clamping the 2 in. U-shaped base plates on the lower strongback. To the upper strongback are clamped the top flange and the second-reduction bearing, the latter having been previously subassembled and positioner welded. The three wall subassemblies are then set in place and tacked to the base plate, after which the upper strongback is dropped in place and the walls aligned and tacked to the parts mounted on it.

At this stage, the entire assembly is bolted to the table of a 20 ton positioner (Fig. 7), and the major welding operation is started. Parts are progressively fitted and welded until the half is completed, with all the cells blocked in.

Joining Subassemblies

When the two halves and the front and rear bearings are completed, they are set on a large slab and carefully aligned to hold center-to-center distances between bearings to plus or minus ⅛ in. The subassemblies are then clamped and braced, and the joining welds are made. The completed weldment is tested for oil tightness, and scribed lines are laid out to indicate the location of the finished surfaces after machining. Before machining is done, the unit is stress-relieved. It is slowly heated to 1,150-1,200 F, held at this temperature for five hours and cooled slowly.

The plant delivers one case every week with a crew of only eight fitters and weldors to do the assembly work.

Welded Caps and Covers

Other parts made by Waldrip to complete the unit are the cover and the bearing caps for the six bearings. The cover is completely fitted on a jig mounted on a strongback, removed and clamped to another cover to give rigidity while welding. It is then positioned for welding by clamping trunnions on each end so that it may be rotated about a longitudinal axis.

Work such as that just described well exemplifies what can be done by a small but progressive and properly equipped "weldery." Other jobs being handled by Waldrip include special light and heavy stainless weldments and piping, amphibious tank sprockets, Diesel engines, etc.

☆ ☆ ☆

Plug Welding Brush Holders

THE Illinois Terminal Railroad Co., Decatur, Ill., recently desired to make a design change while modernizing a quantity of brass carbon-brush holders. This shopping program included the relocation of the hinge-pin holes of the holders. The particular holder illustrated has seven partitions. Since a one-piece hinge pin was to be used, it was necessary to plug weld the old holes in each partition and redrill them in perfect alignment.

Aluminum-bronze rods producing a Brinell hardness of about 160 were recommended for the plug welding of the old holes. Homogeneous weld deposits of strength equal to the original brass castings and of sufficient hardness to assure good wearing surfaces for the hinge pins were obtained.

Courtesy, Ampco Metal, Inc.

To rebuild and modernize this carbon-brush holder, the old hinge-pin holes were plug welded with aluminum bronze and redrilled in new locations.

★ RESEARCH

Arc Welding Pure Aluminum

The British chemical industry needed vessels of high-purity aluminum to withstand corrosion. Metallurgists overcame the welding difficulties by switching to the metal-arc process—and a new type aluminum electrode.

By **F. H. KEATING**
London, England

THE welding of aluminum for the chemical industry is attended with special difficulties not encountered in other applications of commercial aluminum welding. Such difficulties arise from the corrosive conditions in which aluminum is often used for chemical manufacture.

High Purity Essential

Because of the above conditions, it is essential to use aluminum of a high degree of commercial purity: 99.5% al. is the minimum standard permitted and a still higher degree of purity is desirable if it can be attained without undue cost. This high-purity aluminum offers good general resistance to many corrosive media of an oxidizing nature.

The impurities most often found in the aluminum used in the chemical industry are silicon and iron. Complications in the welding of the material arise from the effects of the welding heat on these impurities. In rolled sheets, bars or other highly worked aluminum products, silicon and iron are present as highly dispersed small particles. Their effect is small on the corrosion-resistant properties of rolled or worked products. Nevertheless, highly significant changes occur when the wrought product is heated during welding.

They Form an Eutectic

These changes are mainly due to the fact that iron and silicon are very sparingly soluble in *solid* aluminum. When aluminum containing these two elements is heated to a temperature above its melting point, the iron and silicon go into solution in the *liquid* aluminum. As the solution cools, the low solid solubility of both impurities causes them to separate as an eutectic containing high concentrations of iron and silicon. The eutectic has a lower melting point than pure aluminum and is, therefore, the last constituent to solidify. Consequently, it is located as a more or less continuous network around the pure aluminum grains. Being largely an alloy of silicon and iron, its corrosion resistance differs widely from that of pure aluminum, and its presence will result in severe preferential corrosion attack along the grain boundaries when the metal is exposed to many corrosive media.

Secondary Effect of Heat

The heat applied in welding produces a second effect of equal or perhaps even greater importance. The zone of the parent plate immediately adjacent to the weld is heated to a temperature that closely approaches the melting point of aluminum and exceeds that of the eutectic. When the zone adjacent to the weld has cooled, two changes are found in its structure. First, considerable grain growth has occurred, and, second, the enlarged grains have a more or less continuous film of the iron-silicon eutectic. Thus the zone immediately adjacent to the weld offers as favorable conditions for preferential grain boundary corrosion as does the weld itself.

The problem of welding pure aluminum satisfactorily therefore devolves into a matter of eliminating or reducing the preferential attack on contaminated grain boundaries. The investigation which elucidated the details of this problem was conducted in the Laboratories of Imperial Chemical Industries at Billingham, England. The ideal solution, naturally, was to use a very high-purity aluminum which contained only insignificant traces of silicon or iron. This solution, however, involved a very considerable increase in material cost, and so other methods were investigated.

The Heat-Affected Zone

It was clear that the problem involved more than the mere deposition of weld metal free from impurities, *i. e.*, using filler metal of very high purity. Such a solution would still leave untouched the heat-affected zone adjacent to the weld. In ¼ in. aluminum plate welded in the orthodox fashion (by oxy-hydrogen and oxy-acetylene flame), the width of this affected zone on each side of the weld is about ⅛ in.

Fig. 1 shows a typical weld and reveals the presence of the iron-sili-

An aluminum vessel of 3 ft diameter welded by the metal-arc process. The corrosion-resistant properties of pure aluminum are necessary to the chemical industry.

con eutectic films in the weld itself and in the adjacent affected zone. One obvious method of reducing the width of this zone was to substitute metal-arc welding for the gas-welding process. The much higher temperature of the arc enables actual welding to be done without the extensive heating required by the gas welding since the intensive heat of the arc is concentrated at the actual point of welding and consequently less metal is subjected to serious thermal disturbance. Furthermore, the quantity of metal passing across the arc—the actual deposited metal—is at a very high temperature and will be quickly cooled by coming into contact with the cold parent metal. The latter is, of course, preheated to a considerable degree in gas welding. The rapid cooling tends to reduce the quantity of impurity coming out of solution and to prevent its aggregation.

New Aluminum Electrode

These facts led to investigation of the possibilities of depositing pure aluminum by the metal-arc process. Through collaborative work between the laboratory mentioned above and that of the Arc Manufacturing Co., London, a successful electrode was eventually evolved.* Not only does this electrode show the advantages discussed above, but it is free from a defect associated with earlier attempts at metal-arc welding of aluminum—the presence of numerous small gas holes in the deposit. This defect was traced to the electrode coating, and the manufacturers succeeded in producing a new type of coating quite free from the tendency to generate gases in dangerous quantities.

Moisture-Free Coating

The success of the coating depends on its absolute freedom from moisture. It was found that moisture, whether derived from the paste normally used for electrode coating or from the water of crystallization of the salts used in making up the coating, was responsible for the presence of gas holes in the weld deposit. To overcome this difficulty, the electrodes are dipped into a bath of *fused* salts, and the resulting coating is thus quite free from moisture. The desirable moisture-free condition can only be maintained, however, by storing the electrodes in sealed containers and withdrawing them one at a time as required for immediate use.

*For full details, see Institute of Welding Quarterly Transactions, July-October, 1943, Vol. 6, Number 3-4.

Advantages

Welds made with the new electrodes have been shown, in the laboratory and in commercial practice, to have the following advantages:

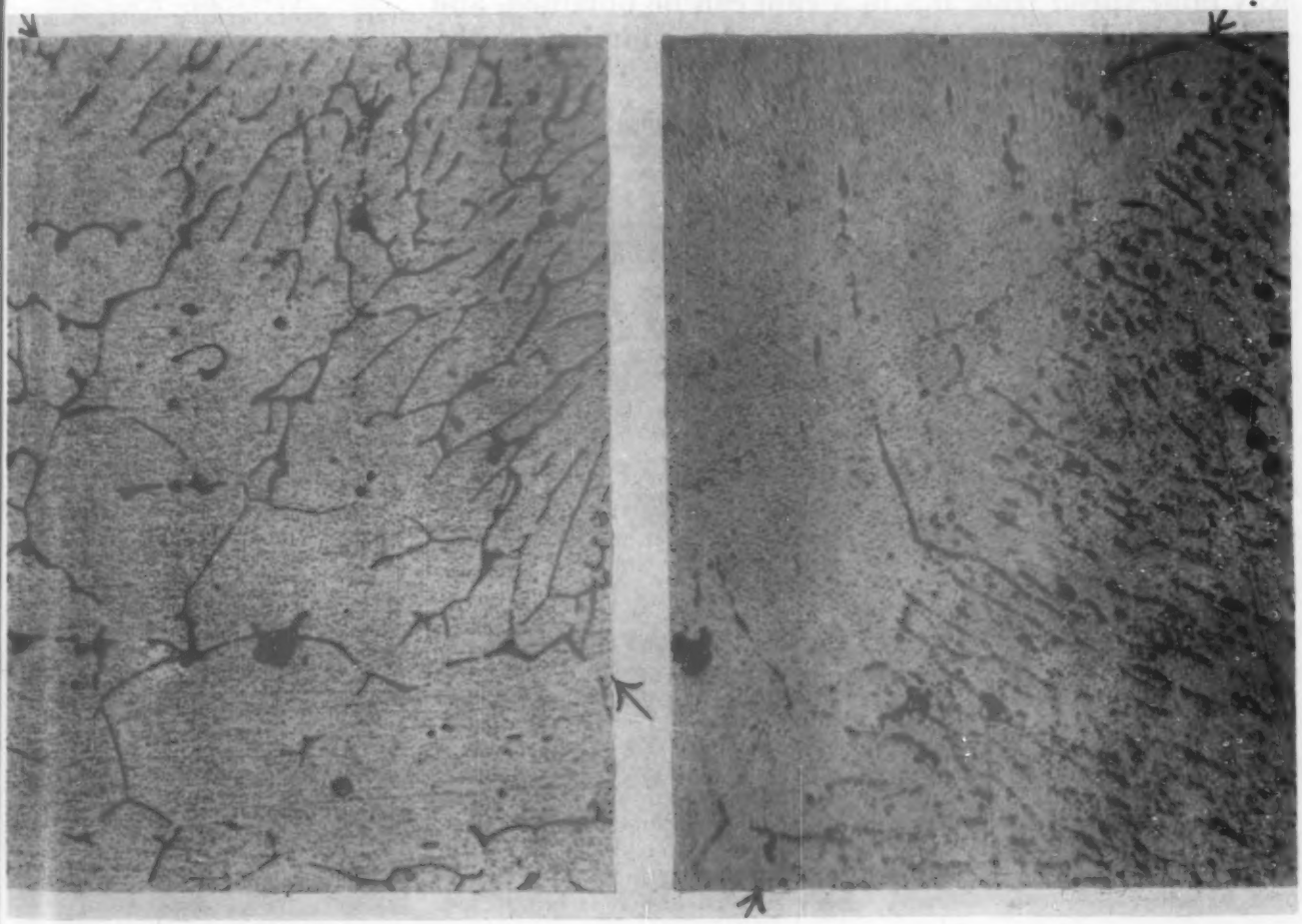
(1) The films of iron-silicon-aluminum eutectic in the deposited weld metal are much less continuous and, for a given composition, less in quantity.

(2) The heat-affected zone is very considerably reduced and the films are less dangerously located. Thus on a ¼ in. plate welded by oxy-gas, the width of the dangerous zone is ⅛ in., as previously stated. On a similar plate metal-arc welded, the width of the zone is 0.003 in. Fig. 2 illustrates the small extent of the heat-affected zone and also the absence of well marked grain boundaries.

(3) The metal-arc process has the advantages of greater speed, reduced distortion and easier manipulation.

Fig. 1—An orthodox aluminum weld. The arrows indicate the location of the diagonal line dividing the weld metal from the heat-affected zone. Note the large grains of the latter below the diagonal line. Magnification 300X.

Fig. 2—A weld made with the new aluminum electrode. Note the small extent of the heat-affected zone and the absence of well marked grain boundaries. The arrows mark the location of the diagonal dividing the weld metal from the heat-affected zone. Magnification 300X.



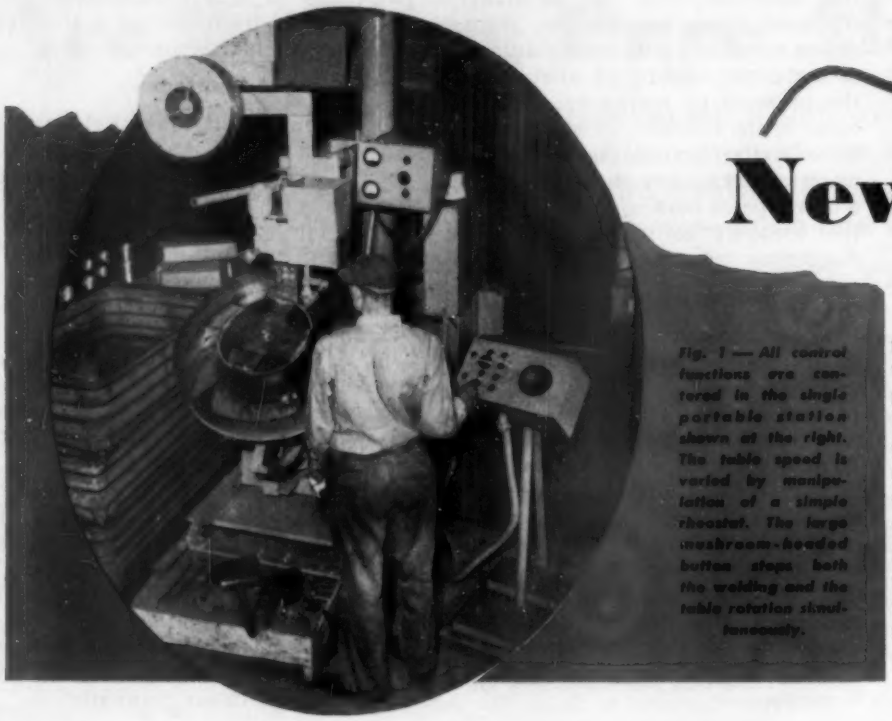


Fig. 1 — All control functions are centered in the single portable station shown at the right. The table speed is varied by manipulation of a simple rheostat. The large mushroom-headed button stops both the welding and the table rotation simultaneously.

New Contro

Application of a variable-speed drive turns the welding positioner into a brand-new tool for automatic welding. Any table speed from 0.3 to 3 rpm can be obtained, and welding and table rotation are started simultaneously.

MANY of the war's most remarkable production records have been achieved by the introduction of new automatic production tools. The greatest improvement in production tools during the past ten years has been in the simplification and increased efficiency of controls, and this has been especially true of welding.

War Brings Automatic Processes

Prewar arc and gas welding had depended almost entirely upon the skill of the individual craftsman. When the war brought about a shortage in the supply of skilled weldors, the use of welding would have been greatly curtailed if it had not been possible to design machines which would do a satisfactory job without depending too much on the abilities of the individual operator. Automatic welding was introduced to meet this war-born production need.

Because of the length of time necessary for set-up, automatic welding is ordinarily advantageous only under high-production conditions involving a large number of similar operations. In cases where its use is indicated, there are two elements controlling the speed of production: welding time and handling time.

In the past, it has been welding time which presented the chief problem. This is true no longer. Welding speeds of 40 inches per minute are now being attained, and speeds of 70 to 100 in. per minute are within reach. The situation has been reversed, and handling time rather than welding time has become the principal problem of automatic welding.

New Use for Positioners

Among the several factors making up handling time, an important element is the operation of the positioner. Originally, the function of a positioner was merely to hold the work for downhand manual welding. Little else was expected of it. It was operated in the simplest possible way, either by hand or by an a-c motor, and low cost was the primary consideration. As adapted to automatic welding, the positioner has become a continuously operating production tool that makes possible simpler and more accurate control of the work. Let's see just how it is being used.

The Reliance Electric and Engineering Co., Cleveland, confronted with the problem of producing large numbers of welded parts for the Navy, purchased a continuous welding head and rebuilt a welding positioner to handle the work. The control for the automatic welding head was supplied by its manufacturer and so was not synchronized with the positioner table. Operation soon proved that for best results the table and the arc should start simultaneously, and such an arrangement was made.

Portable Control Station

Simplicity and ease of operation are the first requirements in designing controls for production tools. The simpler the operation, the more probable its effective use by personnel who vary in experience and skill. To

Fig. 2—The motor is connected by means of a V-belt, reducer and chain. It starts, stops, reverses and varies the operating speed of the table.

for Automatic Welding

achieve this ease of operation in automatic welding, Reliance engineers centered all control functions in the single portable station shown in Fig. 1.

An infinite number of speeds, predetermined for each job, were made available by applying one of the company's own products—its adjustable-speed "V*S" drive. With this unit, any speed can be set by manipulating a simple rheostat equipped with a speed indicator. The actual range included is about 0.3 to 3 rpm of the table. As the ratio from motor to table is 860:1, there is ample torque even at 0.3 rpm.

In order to bring the work to the proper starting point, the operator presses a special button. This button rapidly traverses the table, regardless of and without interference with the operating-speed setting. When contact has been made and the rod is covered by flux, the operator presses either the "weld forward" or "weld reverse" button.

The welding and table motion start simultaneously. During the operation, and particularly while the first pieces of any given run are being welded, the operator may feel that the weld could be improved by a change of table speed; the correction can easily be made from his control station while he is still observing the work. When the weld is completed, the operator presses the mushroom-headed stop button, causing the welding and table to stop and the welding rod to retract about ¾ in. The latter action is entirely automatic.

Simplified Set-ups

For set-ups, the welding rod can be manipulated accurately and simply. Formerly, this had to be done by "jogging" and required considerable skill just to make contact. The variable-speed control causes the welding rod itself to creep down to contact with the work, or the direction can be reversed and the rod caused to move away.

The original design required two men for set-up because of the location of the various controls at widely separated points. Since the portable control station combines all necessary controls at one point, set-up can now be done by one man.

The equipment is simple. The motor is connected by V-belt to the reducer, as shown in Fig. 2. A single light chain transmits the power directly from the reducer to the table drive shaft.

Control Panel Functions

The special control panel (Fig. 3) would have been made considerably smaller if it were to be used only for the control of the variable-speed drive. However, it has many other functions. In addition to providing the starter for the "V*S" control unit and the motor-generator set operating the wire-feed motor, it also contains the reversing contactors for both wire-feed and table motors, reversing contactors for the tilt motor and the table dynamic braking and rapid transverse relay. This single control unit greatly simplifies the machine wiring, making it possible to combine all of the controls in a single portable station.

The time of a set-up man is required, as it is in all automatic operations using inexperienced operators. An intelligent operator, however, can become sufficiently familiar with the machine in a period of 30 days to become his own set-up man.

Operators Trained in 48 Hrs.

The "V*S" control, the company believes, has gone a long way toward making automatic welding truly automatic. Excellent results can be obtained by inexperienced operators having as few as 48 hours of instruction and supervision. The table speeds can be set by anyone who is capable of reading a dial.

Fig. 3—The control panel at the right provides the starter for the variable-speed control unit and the motor-generator set for operating the wire-feed motor. It also contains reversing contactors for the wire-feed and table motors, reversing contactors for the tilt motor and table dynamic braking and rapid traverse relay.

★ PRODUCTION

Better Jobs from Flame-Cutting

★Part One—This article begins a new three-part series that tells you how to get the most out of shape-cutting machines. Types of machines and tracing devices, when to build a template, nesting methods, template storage and work tables are some of the topics discussed here.

By **A. F. CHOUINARD**
Research & Development Dept., National Cylinder Gas Co.

THE primary function of the flame shape-cutting machine is to propel one or more torches along a predetermined path. It is obvious that the size of pieces to be cut and the number of torches will determine the ultimate size and cutting area of the machine.

Rule for Machine Size

In discussing the size of machine necessary to handle economically a particular cutting job, it is well to remember that, as a general rule, the length of the machine should be twice as long as the longest piece to be cut. This cannot be strictly a hard and fast rule, but it should serve as a basis from which to start. The principle involved is that the economies of production are best served when the machine is kept in actual cutting operation the greater part of the time.

The shape-cutting machine should be considered as a strictly mechanical copying device. Its chief elements are: (1) a table upon which a pattern is placed; (2) means for following the shape indicated by the pattern; (3) a suitable mechanism to convey the motion followed by the tracing device to the torch. Obviously, the torches must follow the same path as the tracing unit, the path of which is determined wholly by the desired shape.

Copying Mechanisms

Two general types of mechanisms for mechanical copying are used in the oxy-acetylene industry. One of these is the pantograph type, which is similar to a mechanical drafting machine or a mechanical drafting pantograph. This mechanism consists of parallel pantograph arms which are hinged so that they may work either backward and forward or sidewise to allow the tracing device to follow the pattern. The tracing device is located close to one arm, while the cutting torches are located close to the other one. This type of machine is usually supported by a carriage base that may roll backwards and forwards on guide wheels along the tracing table and adjacent to the actual cutting area.

The other general type of mechanical design includes a carriage which rolls along a pair of longitudinal rails, located parallel to both the tracing table and the actual cutting area. The carriage is equipped with a second pair of rails at right angles to the first, and the tracing device travels along the latter carriage rails. The torch or torches are also supported by the carriage rails, and there is a connecting bar between the tracing device and the torches so that the path of the latter is identical to the path followed by the tracing device.

Incidentally, it should be noted that most tracing machines for shape cutting are constructed to trace a full-scale path. In this way, no errors or multiplication of the pattern trace are found in the final cut steel shape.

Tracing Devices

There are two general classes of tracing device—the manual and the template tracer. The manual tracer, as its name implies, is guided and directed manually, while the template follower or tracer follows the predetermined path of a template. The manual tracer follows a line drawing or blueprint, which must be drawn to make allowance for the width of kerf produced by the particular size of cutting tip employed.

The mechanical template tracer follows a strip welded to the metal base plate (or accurately affixed by some other means) to form a track or guide. On either side of this track or template are two rollers, one power driven. The template has a serrated edge which meshes with the flutes on the driving roller of the template tracer.

Another type of template tracer directs torch travel by magnetic attraction. The holding effort to maintain the driving wheel against the perimeter of the shape is provided wholly by magnetic attraction.*

When to Build a Template

There is no hard-and-fast answer to the question, "What is a reasonable quantity run that would justify the construction of a template?" The answer depends not only upon the numerical number required, but also upon how closely alike each cut piece must be to the others. If it is highly desirable that the pieces be identical

Fig. 1—A large variety of shapes may be cut in a single set-up, as this picture proves.

*An electronic control can also be used to guide flame-cutting machines. In this case a paper template is used, which consists simply of a drawing done in either heavy pencil or ink lines. See "Electronic Control of Flame-Cutting Machines," by R. D. McComb, THE WELDING ENGINEER, December, 1943.

it is conceivable that a template would be made for as few as three or four pieces.

Operator Skill a Factor

One of the deciding factors in the above question is certainly the skill of the operator. If his ability in tracing a line drawing manually is high or above average, and the production department is willing to accept his work —in some cases grinding off or filling in for the inevitable tracing mishaps— then obviously the answer would be never to make a template. On the other hand, a template is always necessary when identical pieces are required. In the final analysis, only the experience and costs of the particular shop can be the deciding factors.

Another question that frequently arises in machine shape cutting is, "Should the template be moved each time a succeeding plate set-up is made?" The answer depends upon whether or not the production department desires to keep the machine operating continuously. If continuous operation is desired, then certainly a duplicate template set-up should be located in the so-called second half of the cutting cycle. During the time that the second cutting is being done, the first cut pieces are removed, scrap cleared away and the work area reloaded for subsequent cutting.

Nesting Odd Shapes

Fig. 1 illustrates in a small manner the variety of shapes that may be cut in a single set-up. In some plants it is standard flame-cutting practice that once a standard size of plate section is placed in position for cutting, it should be completely cut up before removal. The templates are made in such a manner that a variety of shapes are nested. This method utilizes as much of the material as possible and eliminates to a large extent the disadvantages of having to stock the odd sizes and thicknesses of plate that would be necessary for cutting out small sections.

Fig. 2 indicates the general principles involved in nesting a variety of shapes on one template. This particular organization manufactures products that are somewhat stable in design and can therefore obtain the economies applicable to jobs planned for large production runs. The significant point, however, is that the management has given a great deal of thought to the judicious use of flame-cutting. Scrap storage has been minimized, and the cutting torches are kept in operation for as long a time as possible.

Filing and Storing Templates

Time is saved in many ways if a

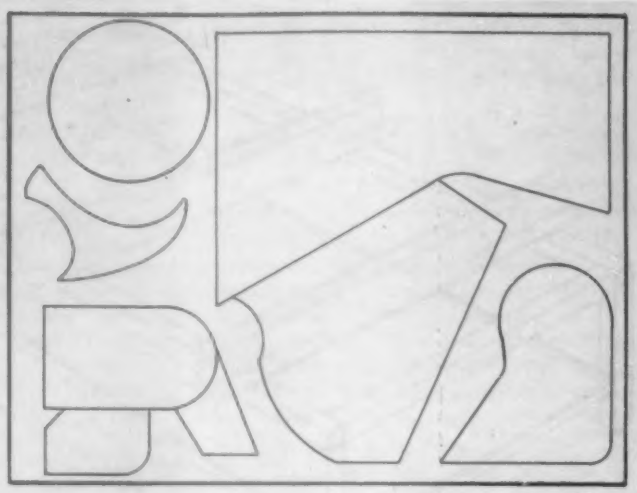


Fig. 2—This sketch illustrates some of the principles involved in nesting irregular shapes to keep scrap to the minimum.

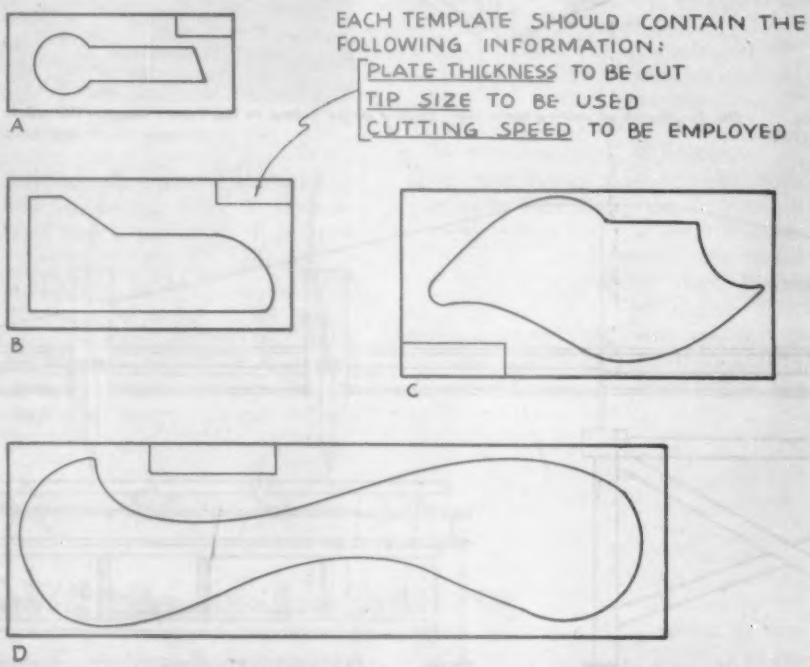


Fig. 3—Templates should be filed (stored) like engineering drawings with all the data needed to duplicate the set-up conveniently at hand.

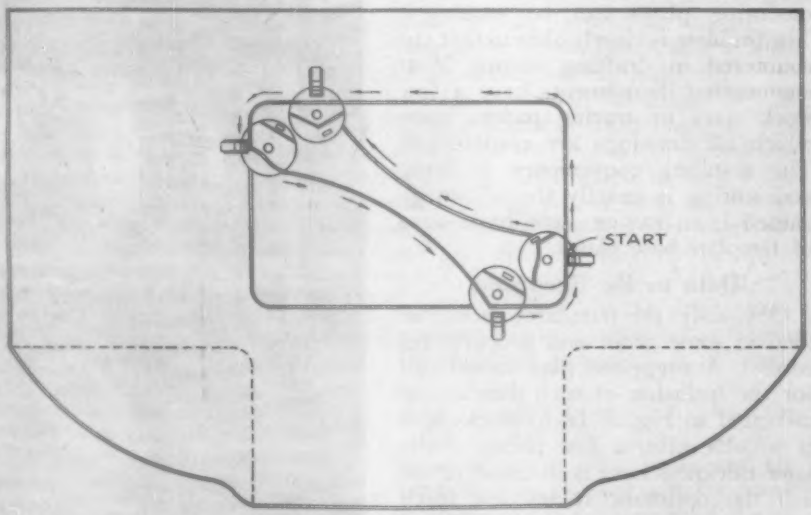


Fig. 4—Template with mechanical switchovers. The four gates are rotated about the axis points indicated by the four small circles to direct the torch on a new path.

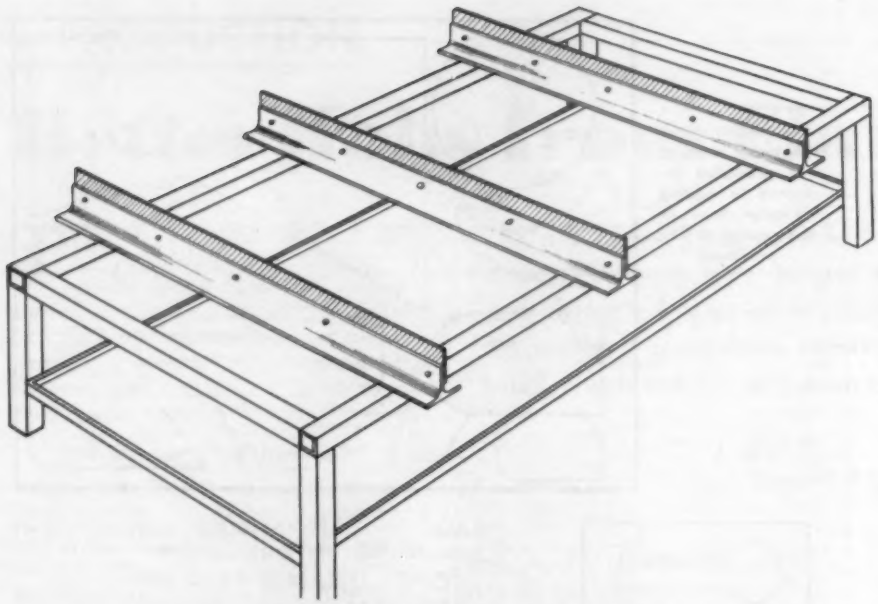


Fig. 5—Sketch of cutting table top. Copper strips bolted to the T-bars support the work.

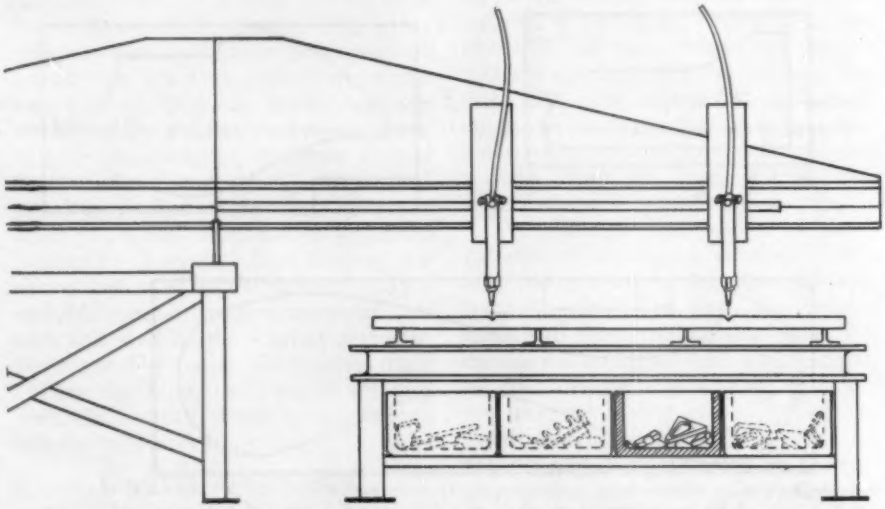


Fig. 6—Slag bins should be kept to comparatively small size to facilitate removal and emptying.

few basic sizes of template base mounting plates can be employed. The problem is closely akin to that encountered in drafting rooms. Most engineering departments have a few stock sizes of tracing papers upon which all drawings are constructed. The resulting convenience in filing and storing is exactly the advantage gained from having some basic sizes of template base plates.

Data to Be Recorded

Obviously, the templates should be filed in some order and properly recorded. A suggested plan would call for the inclusion of such data as are indicated in Fig. 3. In most cases, it is possible after a few pieces of the same thickness have been cut to establish the optimum values for torch travel or cutting speed, cutting oxygen pressure and the tip sizes to be employed when a particular template is to be used. By recording this data with the template, uniform results will be maintained regardless of the time elapsing between cuttings.

Mechanical Switchovers

Fig. 4 illustrates a template constructed with mechanical switchovers, of which four are shown. The objective desired was to obtain the shape indicated by the large outline. A rectangular hole was to be left in the middle of the section, and from the resulting scrap two pieces of metal were to be shaped to fit onto the lower corners as shown by the dotted lines.

The mechanical switches pivot as indicated by the four small circles. One possible method of cutting this particular section would be to start in the lower right-hand corner and continue around back to the starting position. After the template tracer has passed the first gate, the gate is rotated in such a manner that the torch is directed along the path indicated by the arrows. The use of the switchovers permits the torch to be in almost continuous operation. All cutting edges are merged or blended into the preceding ones, greatly improving the overall appearance of the cut edges. Without the switches for the template track, at least three templates would have been necessary.

For pieces of such a complicated nature as this, a small amount of time spent in laying out and constructing the template will pay big dividends in keeping the actual cutting process in operation for a longer portion of time. Set-up time is likewise reduced. In the example shown, a certain amount of time would have been necessary to position the extra templates with respect to the previous cut edges.

Fig. 7—The longitudinal supports of this table are made of wide I-beams to give rigidity under the heavy weight of metal.

Fig. 8—Another type of table with locking means and positioning stops.

Also the template with switchovers produced smoothly blended cuts with a minimum amount of starting time. The final surfaces of both the rectangular cutout and the two lower corner pieces were highly satisfactory.

Cutting Machine Work Tables

Consideration must be given to the construction of the tables upon which the metal plates are placed for cutting. The most important thing to remember about work tables is that they should be built strongly enough to withstand crane loads being dropped upon them. The exact construction is not of too great importance if it provides for this rigidity. A second consideration must be a provision for the removal of slag; this can be accomplished by allowing clearance between the bottom of the table supports and the floor so that the slag may either be dragged out or slag bins removed.

Fig. 5 shows a simply constructed table. It is strong enough to support the type of work that will be placed upon it. Copper strips are bolted to the T-bars at the top so that the top edges of the supports will not be flame-cut as would be the case if they were made of ferrous metal.

Fig. 6 shows how slag bins may be positioned underneath the work table. Notice that a number of these bins are provided to facilitate removal. Obviously, one bin extending the full length of the table would be next to impossible to drag out and empty when it has filled with slag.

Fig. 7 illustrates a more simple type of work table. The longitudinal supports are made of reasonably wide I-beams that will withstand the weight of the metal without deflecting.

The table in Fig. 8 is provided with a means to lock the plate in position for cutting and provide definite positioning stops. In this way, the metal to be cut will be properly aligned with the template. This particular table does not have slag bins, but ample space has been left between its underside and the floor for removal of the slag droppings.

Welded Hoist Frames

THE Jaeger Machine Co., Columbus, O., now building hoist and winch frames and drums for the Navy, switched to welding to solve wartime problems and as a result has decided not to return to the old cast-steel designs in peacetime.

The new welded hoist frame has smoother lines and a more pleasing appearance. More important, it has a more favorable strength-weight ratio than the steel castings.

The steel plates are formed before welding, at least four forming operations being performed on the base plate and eight operations on the two side plates. The bearing supports welded to the side plates are also formed in a power press. The forming operations reduce to a minimum the required footage of welding, and the resulting weldments will thus contain fewer residual stresses and distortions.

Much heavier plates are required for the welded drums. The half sections of the drum barrels are forged and subsequently trimmed and beveled with the oxy-acetylene flame in preparation for welding. The two sections of the barrel are tacked together before being placed in the assembly jig, which centrally locates the drum barrel with respect to the drum flanges. Tack welding is done in this jig. A view of the drum after tacking is given in the accompanying picture.

Courtesy, Metal & Thermit Corp.

The assembled drum after tack welding. Final welding will be done on a positioner in a predetermined sequence to avoid distortion.

After removal from the jig, the drum is placed on a positioner for final downhand welding in a predetermined sequence. Distortion is kept to the minimum by proper fit-up and by balancing of the welds as the work progresses. The result is that the drums are as true to size as the best steel castings. The welded drum has a smoother surface and is better adapted for painting—important on all marine equipment.

In quantity production, the fabricated frames have proved to be no more expensive than the old cast-steel frames. This, coupled with the greater strength and lesser weight of the new designs, assures the future of welded construction at the Jaeger company.

Fig. 1—Incandescent-carbon brazing. Portable welding tongs are used to braze terminals to the leads of an a-c welding machine.

Fig. 2—Oxy-acetylene brazing. The operator is brazing the diaphragm on a copper flange assembly for condenser bushings. A strong, leakproof joint can be made in a few seconds.

Brazing Replaces Soldering

The need for wartime conservation of tin has led to an ever increasing use of brazing or hard soldering for various metal-joining tasks. Extra advantages such as strength and electrical conductivity are often found.

By W. SCOTT
Metallurgical Engineer, Westinghouse Electric Corporation, Sharon, Pa.

EVERYONE knows that great quantities of tin (which our war economy didn't have after our British ally had lost the Malay Peninsula) have been saved through the substitution of brazing or hard soldering for the prewar practice of soldering with tin-rich solders. The methods by which this is being done, however, are not so well known, tending to remain closely guarded trade secrets in all too many instances. It is the purpose of this article to clear up most of the mystery.

Strengths of Joints and Alloys

In the construction of transformers, brazed joints not only conserve tin but are stronger than the old type of soldered joints and have higher electrical conductivity. The strength feature appears rather strange when one considers that most brazing alloys are fundamentally brittle and of low strength in themselves. When spread thin over the parent metal, however, the filler metal penetrates the base metal to form a new alloy that has a greater strength than either component.

A number of competitive brazing alloys are available, some of which are particularly adapted to special work involving a variety of materials. For use on copper, brazing alloys that do not require fluxes are generally preferable. A self-fluxing alloy will simplify the workman's task by permitting him to concentrate his full attention on the brazing operation. Such an alloy also avoids considerable cleaning after the brazing has been completed since there is none of the slag produced by externally added fluxes.

The more common self-fluxing alloys are composed of phosphorous and copper, combined in various percentages. The phosphorous acts as a cleaner and eliminates the necessity of adding an external flux. Various combinations of phosphorous, copper and silver are also used.

Low-Melting-Point Alloy

One of the most widely used of the self-fluxing alloys is free-flowing at 750 C (1,382 F). Its low melting point shortens the heating time and permits the brazing of machined assemblies without distortion. Electrical connections can be made with 100% electrical conductivity based upon the conductor sizes composing the joint. Tinning or electroplating is also possible. These brazing alloys are available in rod, ribbon or special shapes for preplacing where required.

Fig. 3—Brazing with a spot welder. This method facilitates production in the cases where it can be used.

Fig. 4—Electric furnace brazing. The preplaced brazing alloy is heated to the melting point in the presence of a reducing protective atmosphere.

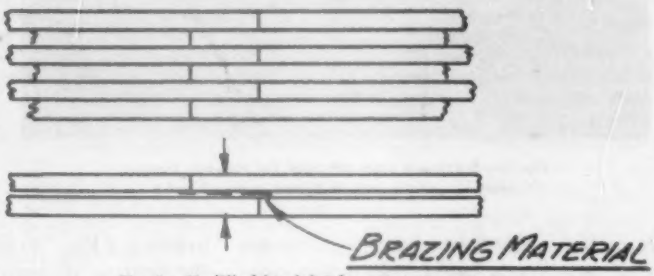


Fig. 6—Modified lap joint for multiple conductors.

Successful low-temperature brazing requires the work to be reasonably clean. All heavy scale, grease or other foreign material should be removed by grinding or chemical solvents before the braze is attempted. It is never advisable to rely solely upon the cleansing action of the flux. Fluxes can do only a limited amount of cleaning; their primary purpose is to protect already clean surfaces and to break up the oxide films that are formed during the brazing operation.

In addition to protecting the joint from the effects of the atmosphere, a flux should also hasten the wetting of the metal surfaces with the brazing alloy. The brazing alloy will flow freely in a thin film as the proper heat is reached in the base materials. As before explained, the brazed joint can develop strength and reliability only when the molten alloy is applied in a thin film—the thinner the better, in most instances.

Unskilled workmen often attempt to build fillets of brazing alloy around the joint. This is largely because of ignorance as to what really occurs during the braze. With a properly made joint, it is impossible to develop a fillet of any size. The presence of fillets usually indicates poor workmanship and/or improper temperature of the base metal at the time the braze was made. Large fillets indicate a weak bond and tend to promote failures in loaded joints because of the inherent brittleness of the alloy. Cracks form readily in large fillets and will quickly spread throughout the joint when it is subjected to stress.

Economically, it is also poor practice to add excess brazing alloy to the joints. The smallest fillets will use five to ten times as much filler material as the joint itself. The additional expense is, of course, particularly noticeable in the case of silver-bearing solders.

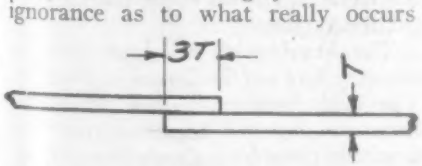
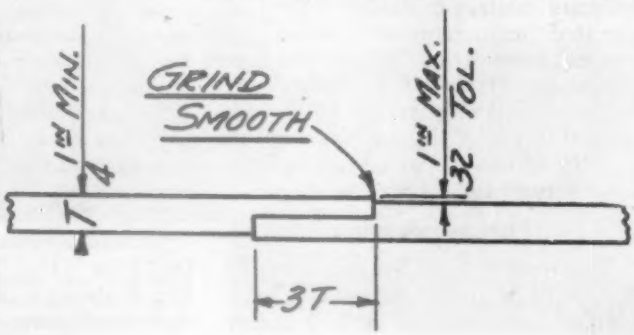


Fig. 5—Schematic diagram of simple lap joint.

Fig. 7—Milled step joint. Note how this type of joint conserves space.



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For electrical connections in transformers we prefer the incandescent-carbon method of heating (Fig. 1); use is also made of the oxy-acetylene torch (Fig. 2) or the carbon arc when it is impossible or uneconomical to use the incandescent-carbon method. Fundamental joint designs are the same regardless of the method of heating. The incandescent-carbon method is faster, uses a minimum of brazing alloy and permits the work to be clamped in position with the tongs—the same equipment that is the source of heat.

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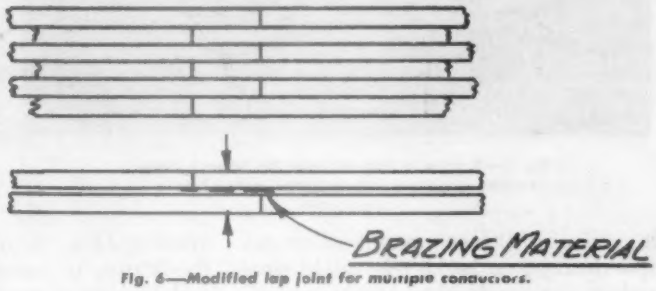

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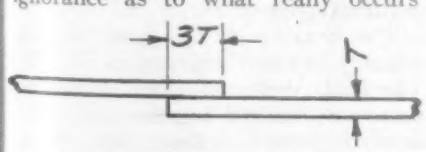

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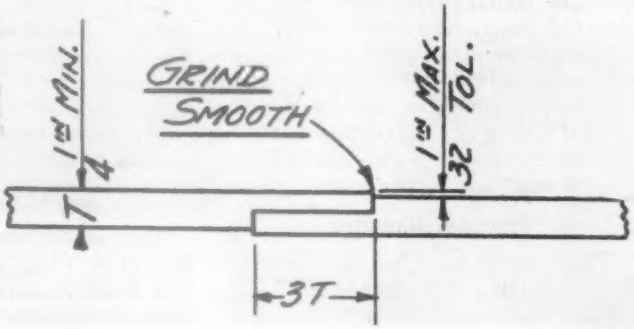

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Fig. 8—Brazing a step-cut joint for furnace transformer secondary coils between carbon blocks.

Fig. 9—Brazing series connections on distribution transformers using oxy-acetylene torch.

duration and fast operation render spot brazing a highly desirable procedure for production operations.

Incandescent-carbon brazing is also a resistance-heating process, but differs from spot brazing in that portable tongs are used instead of a spot welder. The heat is generated in carbon electrodes and transferred to the work by conduction. The tongs are clamped over the joint with enough pressure to insure good contact and to prevent movement of the members during the heat-cool cycle. Since the joints are heated and cooled under pressure, strength is insured with a minimum of brazing alloy, and movement of the parts is prevented during the cooling cycle.

Torch brazing is a very flexible method of heating but is objectionable for use on copper parts because of the possibilities of hydrogen embrittlement. Hydrogen is one of the products of combustion when acetylene and oxygen unite and so is in intimate contact with the copper at elevated temperatures. Commercial coppers have various amounts of copper oxide which will be reduced by hydrogen-forming steam. In the advanced stages of the reaction, embrittlement of the copper occurs and the joint is unfit for service.

Furnace Brazing

Three other basic brazing methods remain to be mentioned: metal bath, furnace and chemical bath. Furnace brazing (Fig. 4) is ideally suited to the heating of many parts at one time and to a wide variety of parts. The brazing alloy is preplaced, the parts are wired or jigged together, and the assembly is heated to the melting point of the brazing alloy in a protective atmosphere. The molten alloy is gradually drawn into the joint by capillary action, and the protective atmosphere prevents oxidation of the joint during heating and cooling. In general, this method results in strong, uniform joints as well as clean, bright joints of excellent appearance.

Brazing baths may be heated by either gas or electricity. In the metal-bath method, the filler metal is obtained from a molten bath of brazing alloy. The chemical bath much resembles furnace brazing in that the alloy is preplaced and the parts are jigged to hold them firmly together until after the assembly has been removed from the bath.

It is highly desirable wherever possible to make the parts self-jigging in design in order to eliminate the heating of the excess material of which the jigs would be made and also because jigs will warp and not hold parts in proper alignment after a few passes through the furnace.

Joint Preparation

In transformer brazing, the simple lap joint (Fig. 5) is fundamental. Fig. 6 shows a modification for multiple conductors, and Fig. 7 illustrates how the step-type of joint conserves space in the transformer. Space, size of conductors and the ingenuity of the designer are the only limitations on the type of connection.

As an example, let us consider the incandescent-carbon brazing of a step-cut joint used in the making of secondary coils for an electric furnace transformer (Fig. 8). The sheet copper, measuring 5/16 by 12 in., is notched out and overlapped for brazing. A thin strip of brazing alloy is placed between the parts before assembly, and filler rod is used to fill small gaps and build up a uniform surface. The brazing heat is supplied by a 122 kva transformer connected to two carbon blocks, 2 by 2 by 6 in. The incandescent- carbon method permits rapid completion of the joint with a minimum oxidation of the copper.

Because of their low-flow points and good fluxing characteristics, phosphorous-bearing copper alloys can be used close to coil insulation without charring it. In brazing series connections on distribution transformers (Fig. 9), the conductors were overlapped in simple lap joints. The oxy-acetylene torch was employed for this particular job.

The brazing of coil leads onto a primary bus bar is shown in Fig. 10. The leads, being of small cross-section, are bunched together and held firmly in place by a short, close-fitting tube slipped over their ends. The as-

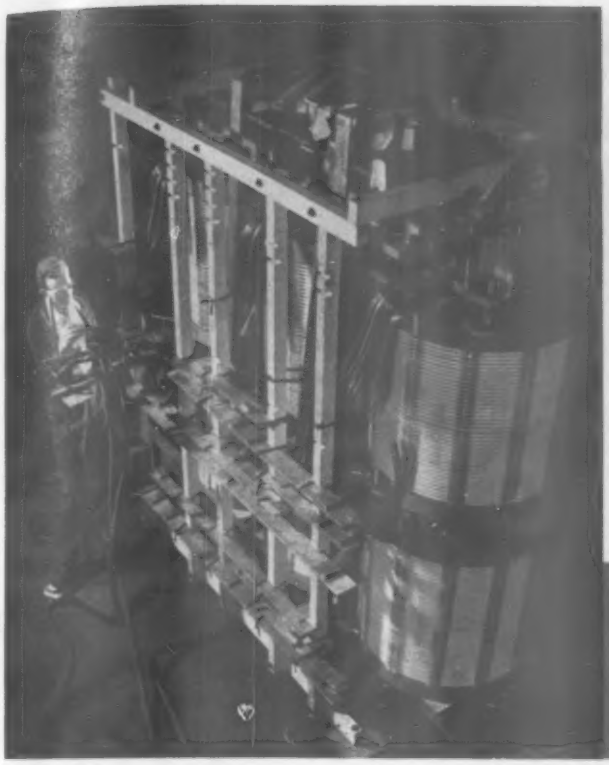

Fig. 10 (left)—Brazing coil leads onto primary bus bar. Carbon tongs supply the heat, and the brazing alloy is applied in the form of a rod.

Fig. 11 (right)—Incandescent-carbon brazing of balancing coils. The leads are neatly stacked, and ribbons of brazing material are preplaced between the layers. Note the refractory packing to prevent the coil insulation from charring.

sembly is then flattened and heated by the carbon tongs. Brazing material in the form of a rod is applied as the proper temperature is reached.

Larger conductors than those of Fig. 8 are stacked with thin strips of brazing material between the layers; additional brazing material, if required, may be added in rod form. The leads are stacked uniformly so as to present a flat surface for contact with the carbon blocks and are overlapped to three times the cross-section in order to maintain conductivity at the joint.

Fig. 11 shows the brazing of leads for balancing coils. These neatly stacked leads had ribbon brazing material inserted between the several layers. The braze is effected by clamping the assembly between carbon blocks and passing an electric current through it. The coil insulation is protected from the effects of heat by packing refractory material between it and the carbon tongs, as shown in the picture.

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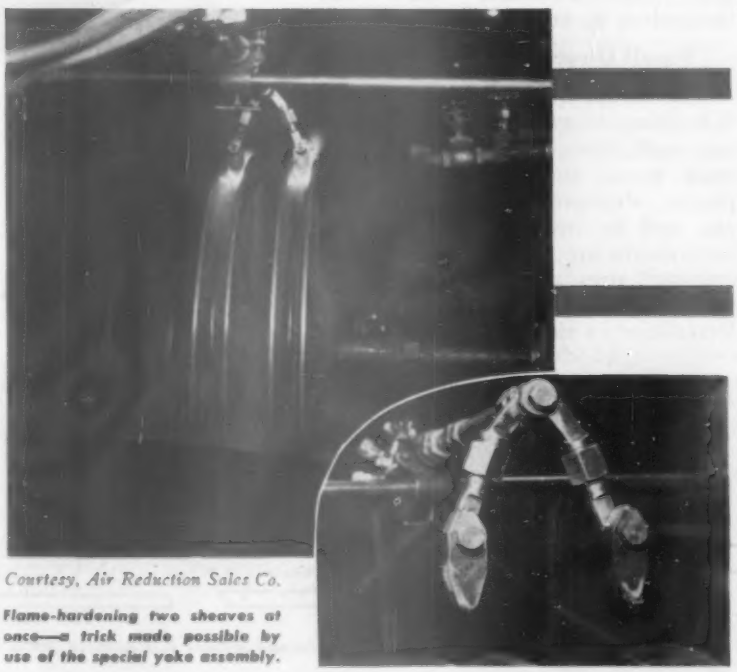
Flame-Hardening Sheaves

By making use of a standard gear-hardening yoke fitted with special tips, two large steel sheaves are flame-hardened simultaneously in the plant of the Wellman Engineering Co., Cleveland. Water-cooled integral heating and quenching tips are used, and these are contoured to provide uniform heating and quenching over the entire wearing surfaces of the sheaves.

The sheaves shown in the picture are of cast steel (0.40% C) and measure 38 in. in diameter by 2¾ in. outside width. They are mounted on a motor-driven shaft geared to provide a surface speed of approximately 5 in. per minute. A scleroscope hardness of 40 to 60 (279 to 426 Brinell) is produced for a depth of 0.125 in.

Oxygen for this flame-hardening operation is supplied from a bulk oxygen trailer through a central manifold in the control room and thence by pipe line to various stations. Acetylene is supplied from six cylinders manifolded together. When a greater quenching than that furnished by the water jets in the tip is desired, a length of suitably perforated pipe is screwed into the fitting shown at the right of the flames in the large picture. A close-up of the yoke is shown in the inset.



Courtesy, Air Reduction Sales Co.

Flame-hardening two sheaves at once—a trick made possible by use of the special yoke assembly.

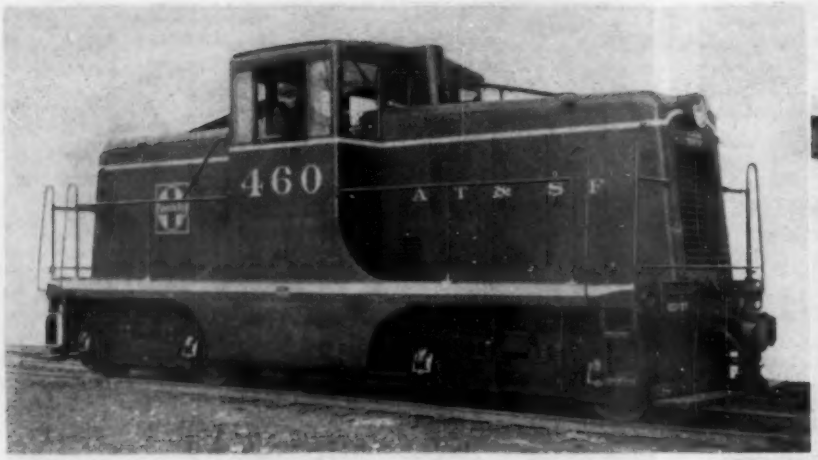


Fig. 1—A 44 ton, 380 hp Diesel-electric locomotive. Both the main operator's cab and the engine cab are shown in this picture.

Fig. 3—Formed sections and sheets are spot welded together as in this end panel.

Spot Welding Locomotive Cabs

Diesel-electric locomotive cabs are being made by spot welding light-metal sheets to formed stiffeners. Spot welding is also used for engine cabs and other parts.

By **W. H. COCHRAN**
Erie Works Laboratory
General Electric Co.

Of all the products that are being welded today, a locomotive probably represents the ultimate in severity of service imposed. Its welded parts are subjected to continual jarring, vibration and racking as well as the effects of atmospheric conditions. Yet welding has been used in the construction of G-E locomotives for a number of years with very gratifying results. The welded parts have proved to have remarkable stamina in all kinds of service; in addition they permit a highly pleasing streamlined appearance and readily lend themselves to volume production.

Small Diesels Do War Work

The locomotive that the company is building in greatest number today is a small Diesel-electric used for light road work, for switching in war plants, shipyards, ordnance plants, etc. and by invasion forces. These locomotives are made in a number of standard sizes as determined by the work they must do. A 380 hp, 44 ton locomotive is shown in Fig. 1. The

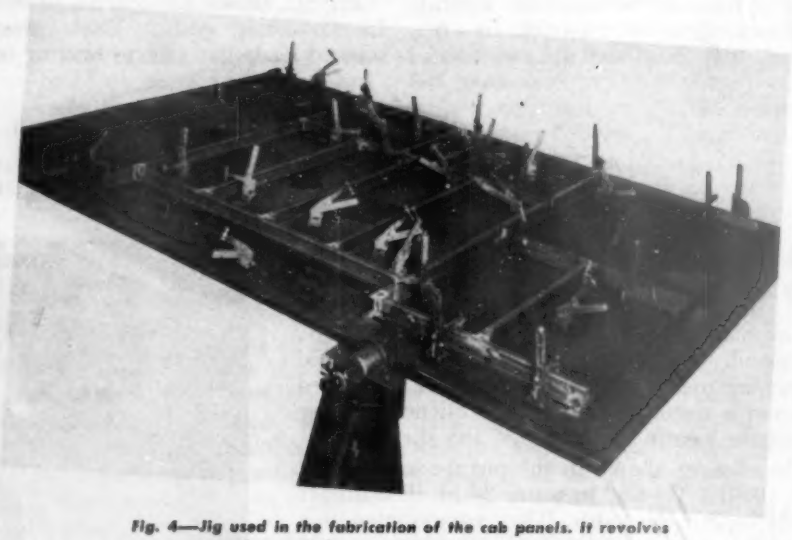


Fig. 4—Jig used in the fabrication of the cab panels. It revolves on trunnions and thus permits easy access to all joints.

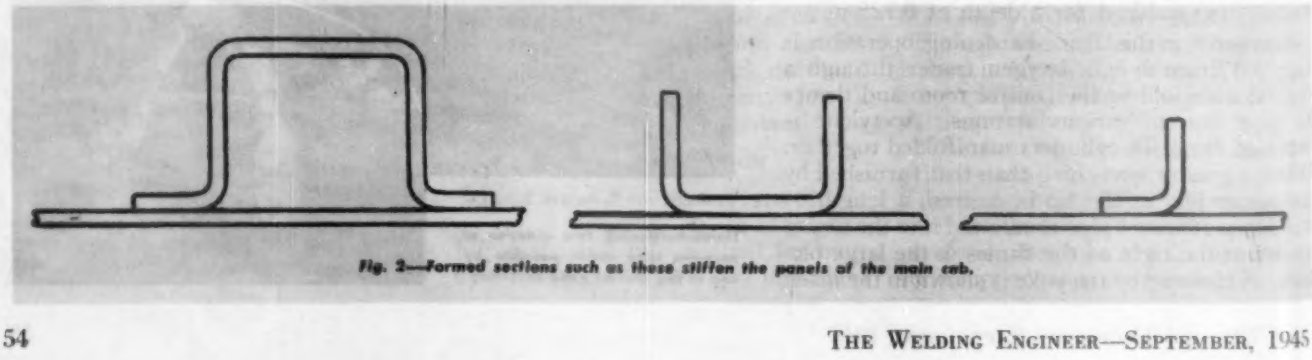


Fig. 2—Formed sections such as these stiffen the panels of the main cab.

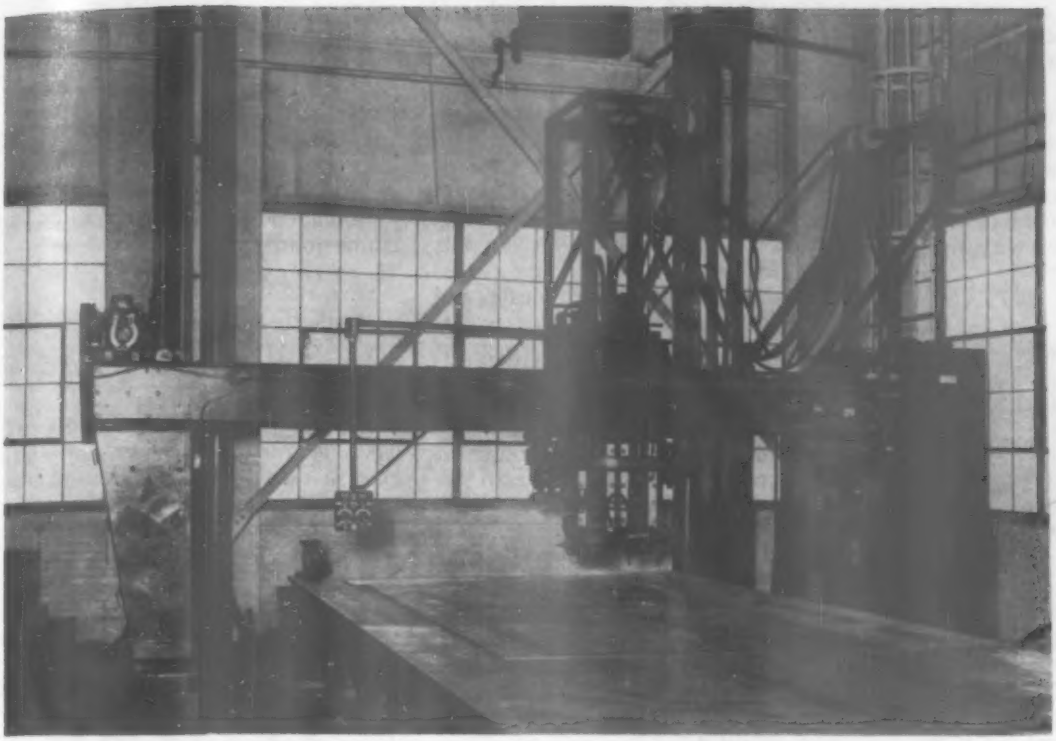


Fig. 5 — Gantry spot welder. The welding heads are on the cross carriage traveling across the work. The gantry frame supporting the cross carriage travels on rails which are set in the floor and which run lengthwise of the table.

main parts to be welded are the trucks, the platform (cab underframe) which spans the two trucks and the cabs for housing the operating controls and power plants. Trucks and platforms were covered in a previous article.* The present discussion will be limited to the welding processes used in the fabrication of the cabs from light metal sheets.

Main Cab Fabrication

The main or operator's cab is fabricated by welding in a manner rather unusual for such structures. Instead of first assembling and fitting the frame and sheets together as is customary with riveted structures, the sides and ends of the cab are built in separate sections and then assembled. This requires that parts be built accurately, otherwise they will not go together without excessive fitting and patching by hand. Designing engineers, working closely with the manufacturing group, have evolved a design that is adaptable to this method of manufacture.

Buckling Avoided

A problem always present when large sections such as cab sides are fabricated from sheet steel is that of distortion and buckling. G-E engineers have overcome it by designing the cab structural frame so that it can be welded together and straightened before the sheets are welded to it. This procedure avoids the distortion resulting from the "pulling" of the welds between the frame members, which distortion normally occurs in the sheets if they are attached to the frame members before the frame joints are welded. Moreover, the inherent distortion of the cab sheets due to heating is minimized by spot welding them to the previously welded frame.

The cab side sheets and cab frame members are made from ⅛ in. low-carbon-steel sheet, pickled and oiled. The frame of the cab is made of formed sections (Fig. 2), used for the carlins, stiffeners and horizontal members. Adequate flanges are provided for spot welding. A typical end panel with frame and sheet spot welded together is shown in Fig. 3.

The jig used for assembling the frame members (Fig. 4) is designed to turn on trunnions so that the joints can be made accessible for welding on all sides. The joints of the cab frame are welded with an E-6010 electrode, using d-c power.

After the frame has been welded and straightened, it is assembled to the cab sheet on a flat table. This table is covered with a special alloy so that spot welding can be done on it.

Gantry-type Spot Welder

A specially designed spot welder (Fig. 5) is used for spot welding the cab frame to the sheets. The motor-driven gantry frame, similar to a gantry crane, runs the full length of the table over a set of rails set in the floor. Mounted on the gantry bridge is a motor-driven cross carriage carrying the transformer, welding heads, air cylinders and slides. The two welding heads are of a series type (circuit completed between two electrodes) and can be turned through 90 deg by means of a power drive.

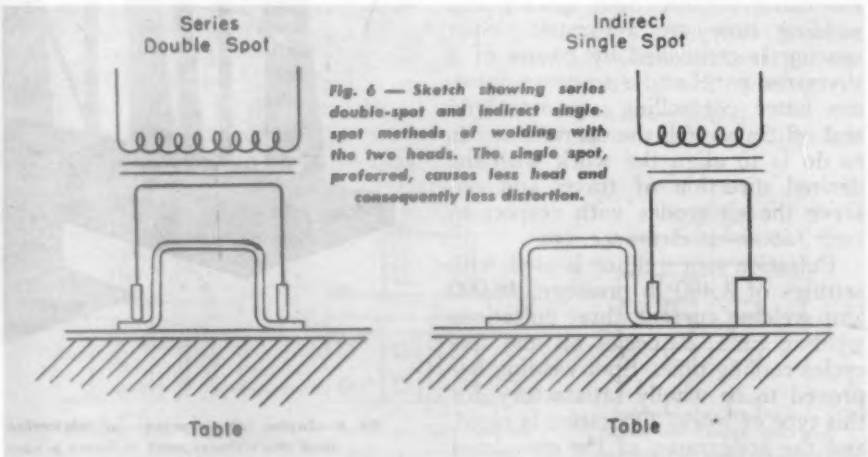


Fig. 6 — Sketch showing series double-spot and indirect single-spot methods of welding with the two heads. The single spot, preferred, causes less heat and consequently less distortion.

*"Fabricating Locomotive Parts," The Welding Engineer, August, 1945.

The welding current is applied from only one side of the work.

Power, air and water lines are run over a tension device mounted on the wall. This device feeds out the hoses and cables as the gantry moves along and thus prevents kinking.

A full electronic control panel, including a sequence control and current regulator together with the necessary control relays, is mounted below the A-section on one side of the gantry frame (right of Fig. 5).

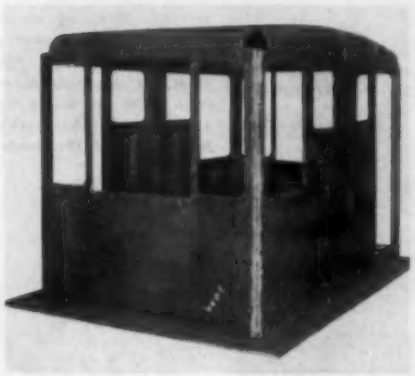


Fig. 7—Arc welding is used to tie together the sides, ends and roof of the main cab. Note the bottom fixture plate on which the members are located.

Single vs. Double Spots

This welding machine is a series-type spot welder. Although the double-spot series method can be used, the indirect method of welding is employed on most work. This is explained by the right-hand diagram of Fig. 6. The indirect method causes less heating of the cab frame members by stray welding current. Consequently, there is less distortion of the side sheets when the indirect single spot is used.

The pendant control box houses all the switches and push buttons controlling the movement of the gantry, the cross carriage and the head-swivelling control. Spot spacing and welding time are automatic. Spot spacing is controlled by means of a thyratron panel and a sequence panel, the latter controlling squeeze, hold and off times. All the operator needs to do is to align the work with the desired direction of travel and observe the electrodes with respect to such factors as clearance, etc.

Pulsation spot welding is used, with settings of 1,400 lb pressure, 18,000 amp welding current, three pulsations welding time, 20 cycles on and five cycles cooling time. Spot welding has proved to be wholly satisfactory for this type of work. Operation is rapid, and the appearance of the completed job is very good. The spot welds will pull an average of 5,000 lb per spot in shear.

Arc welding is used extensively to tie together the sides, ends and roof of the cab. These formed sections are inherently stiff and so do not undergo the serious distortion ordinarily encountered on large flat surfaces. Fig. 7 shows the assembly of a main cab. The sides, ends and roof are placed upon a fixture plate, which locates and squares the parts and provides a reference surface for their correct assembly. Bracing facilities are provided wherever needed to align the edges for back welding.

The butt joints at the juncture of the main cab sides, ends and roof are spaced sufficiently to allow full penetration of the weld metal. A steel backing strip is tacked in place on the inside of the cab. This backs up the butt joints to facilitate welding and also adds stiffness to the structure.

Engine Cab Fabrication

The engine cab is a framework made of formed and rolled structural members with a formed roof sheet. Arc welding is used extensively to build the engine cab, but spot welding is used wherever possible. Assembly of an engine cab on a fixture plate is shown in Fig. 8. The frame joints are fitted together so as to allow for sufficient fillet welds to give the necessary strength. The front end of the engine cab, housing the radiator, sand boxes and headlight, is formed of steel sheet with some spot-welded sections.

The engine cab doors are of spot-welded construction. The frame—a flanged channel U-section with flanges similar to the cab carlins—is spot welded to the door sheet as are the hinges. Spot welding is also used for other parts such as control compartments and winter front vanes.

Spot welding of miscellaneous items is done on a standard-type spot welder. In general, all parts that are accessible for spot welding and can be taken to the machine are spot welded, while arc welding is used at the corners for assembling component parts and for the frame joints.

Testing Spot Welds

While the qualification of arc-welding operators has long been required, the checking of spot-weld quality is relatively new. To ascertain the quality of spot welding, General Electric has put into effect a system which gives a record of the day-to-day results. Every two hours or oftener (as determined by the job requirements), the operator welds three sample specimens of the material used on the production parts. These are tested on a special torsion-testing machine which indicates the maximum torque required to break the specimen and the angle of twist. The correlation of the torque, angle of twist, spot diameter and material thickness furnishes an index of spot-weld quality on the production parts. These tests help to determine the proper pressure, time and current settings for each thickness of material and also indicate whether or not the machine has been set correctly and is operating properly.

It has always been a twin goal of locomotive builders to build a strong, light structure with a smooth exterior of good appearance, and to be able to do this without a tedious job of straightening and patching. By making the proper use of welding processes and designing the product around them, these objectives are now being realized.

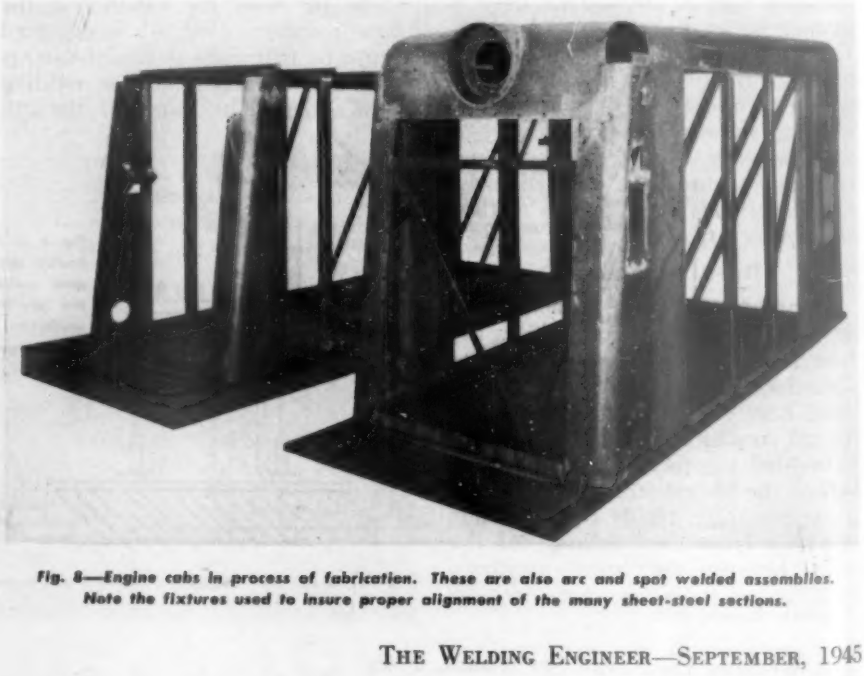


Fig. 8—Engine cabs in process of fabrication. These are also arc and spot welded assemblies. Note the fixtures used to insure proper alignment of the many sheet-steel sections.

Welded Bearings for Frigates

The advantages of fabricating bearings by welding are strikingly demonstrated in the design of big bearings for Frigate escort vessels of the Maritime Commission.

By **G. G. LANDIS**
Chief Engineer, The
Lincoln Electric Co.

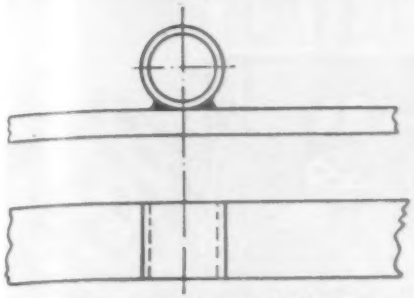


Fig. 1 — Pipe bearing welded to a flat support.

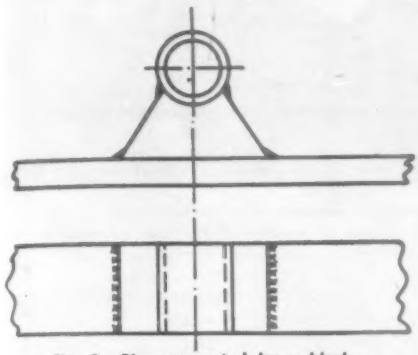


Fig. 2—Pipe supported by a block.

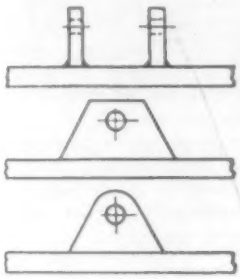


Fig. 3—Bearing made by welding two plates to a support.

IN the design of marine bearings for Frigate escort vessels of the Maritime Commission, a changeover from casting to welding has cut the weight per bearing by about 25% and increased production at least 10%, according to the fabricator, Gardiner Mfg. Co., Oakland, Calif.

Other Advantages

The changeover from casting to arc welding was made after it was found that the cast bearings warped and could not be machined properly. By comparison, the weld-fabricated bearings made for greater ease in babbitting and increased production speed as noted.

Bearings must be made to take the load and transmit it to supporting members of the machinery. In this connection, it may be interesting to summarize briefly some of the principal fundamentals of welded bearing design.

It should be kept in mind that the pressures which the bearing has to support and transmit can be met by welding the bearing to the supporting member. The cost of such fabrication is extremely low, and the location of the bearing is not governed by any conditions other than design requirements. Stiffeners and connection plates may be located and welded to the other parts of the machine as determined by the best design.

Pipe Bearings

The simplest bearing is a section of pipe welded to a flat supporting member, Fig. 1. A pipe supported by a block (Fig. 2) may be used where the bearing must be raised above the support. The block may be shaped to give a good appearance, or it may be merely a rectangular shape. Fig. 2 involves more welding than Fig. 1, but it does not require raising the support as a whole.

Fig. 3 shows another type of bearing consisting of two plates welded to the support. This is used frequently in cases where levers are involved. The bearing is simply and easily constructed from plates cut to the desired shape.

Split Bearings

A modification of the bearing shown in Figs. 1 and 2, Fig. 4 consists essentially of a split tube with plate stiffeners on the side and bosses at the split. The bosses provide for a slight variation in the bearing diameter.

A split bearing with a removable cap (Fig. 5) is made by bolting a plate to the machine and welding to it the lower half of the bearing. The top or cap is then bolted to the lower half. The blocks, shown as rectangular, may be modified in shape to meet the particular requirements of the design.

Two types of bracing for relatively small bearings which must be braced in a line parallel to the support are shown in Fig. 6. The single brace in the center of the bearing is used for relatively short bearings, the bracing at the ends for a longer bearing.

The Frigate Bearings

Three sizes of bearings were required for the Frigate escort vessels earlier mentioned. The stern tube forward and aft bearings have lengths of 2 ft 3¼ in. and 2 ft 3 in., respectively, and weigh 1,600 lb each. A larger frame bearing is 5 ft 6 in. long and weighs about 2,600 lb—approximately 25% less than the previously cast bearing.

Twenty-two pieces of SAE 1040 plate are required for each bearing. The shell is rolled from 1 in. plate; stiffener ribs are made from ¾ in. plate; bearing bands from 1¼ in. plate; outside flanges and side ribs from 1½ in. plate.

Welding Procedure

The flange was first welded inside and out before machining; then the stiffener ribs were welded full length on both sides. The end ribs were fused to the shell and flange of the bearing, and the bearing band was welded to the flange on both sides before tying it into the stiffener ribs. Finally, the side ribs were welded full length on both sides.

AWS E-6012 (all-position) electrodes were used throughout the job, $\frac{5}{32}$ in. diameters being used for the first assembly operation and ¼ in. electrodes for the finish welding. A 50% reduction in welding time was effected by the efficient use of jigs and positioners.

Fig. 4—Split tube with plate stiffeners and bosses.

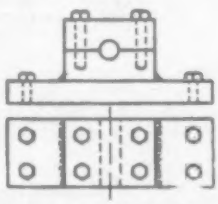


Fig. 5 — Split bearing with removable cap.

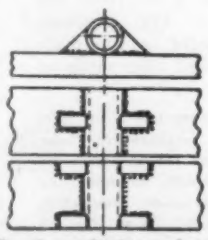


Fig. 6 — Center and end bracing for small bearings.

Short Cuts and Kinks...

Easier Ways to Do Things

A few of the many time and labor-saving ideas developed by tacticians of the production line are presented every month in this department. If you have a good welding idea of your own to pass along, you are hereby invited to contribute it to this section. Send anything you think suitable to: Short Cuts and Kinks, THE WELDING ENGINEER, 506 S. Wabash Ave., Chicago 5.

Horizontal Machine Cutting

By O. J. Williams

WHEN large sections of shell plating are fitted together at a horizontal seam, the new plating is held at the correct elevation but lapping over the plating below. This requires the lower plating to be cut horizontally along the edge of the new section and then cut again to obtain the proper bevel for welding. These cuts were made manually. Because of the awkward position and frequent irregularities and pauses, the cut edge was jagged and crooked. This, of course, placed extra work upon the weldors and consequently hindered the progress of all hull welding.

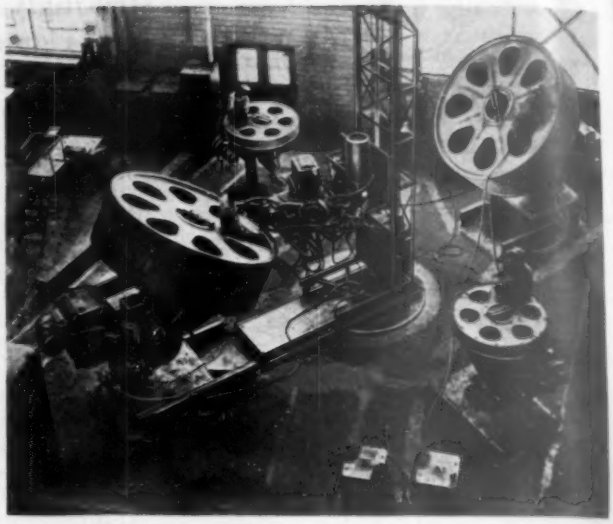
To overcome this difficulty, I suggested to the War Production Drive Committee at Kaiser Co., Portland, Ore., an idea for attachments that would convert a standard flame-cutting machine tractor to make horizontal cuts on vertical plate. The cutting machine is made to run on ordinary track, supported in a vertical plane by a few simple attachments as in Fig. 1.

Each cross tie of the track is bolted to a 1 in. length of 4 in. I-beam (detailed in Fig. 2), which acts as a bracket to hold the track 4 in. from the plate. The brackets are held to the plate by small clips made of 1 by 1 in. angle iron tack-welded to the plate 15 in. below the seam and notched (see Fig. 2) so that the track is placed by merely sliding brackets from left to right or removed by sliding them from right to left. The clips are removed by prying them off or hitting them with a hammer. Any number of tracks may be placed end to end, a small cleat being bolted under the ends to hold them in alignment. To avoid danger of the track slipping sidewise, an extra clip is welded wherever convenient to resist motion toward the left. If the track is near the ends of the hull, it is twisted to follow the curve of the plate.

The tractor is held to the track by two extra wheels, one riding on the upper edge as in Fig. 1 and one riding on the lower edge. The wheels are flanged to carry both the vertical and the horizontal load of the tractor; a spring support prevents them from binding. The wheels support a simple frame that is fastened to the tractor by a rod bolted to a flat bar at the sides. The tractor carried torches as shown in Fig. 1 to make both level and bevelled cuts (see details in Fig. 3) in a single cutting operation.

The adoption of this suggestion has resulted in many definite advantages. Accurate cuts are made because the machine rides a smooth, straight track. Cutting is done at maximum speed by electrical control on the tractor. Welding is speeded because the plates fit neatly at the seams. Second cuts and fusing are eliminated.

Many man-hours are saved by this cutting method. Our experience shows that cuts made by the hand method in 4 hr were easily completed in ½ hr with the machine. The attachments do not injure either the machine or track.



The welding machine is mounted on a turntable and may be readily rotated from one to another of the four positioners.

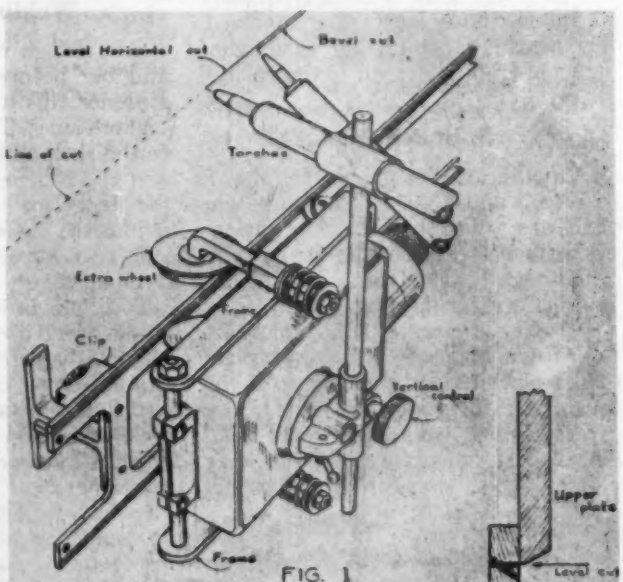


FIG. 1

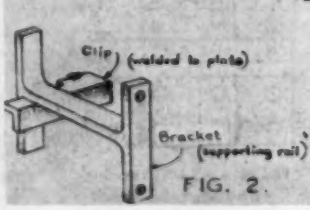


FIG. 2.

FIG. 3.

Horizontal flame-cutting is made possible by these attachments. Fig. 2 gives the details of the clips and brackets supporting the track, and Fig. 3 shows how both level and bevelled cuts are made.

Radially Grouped Positioners

By A. B. Rieneck

AT THE merchant marine division of Westinghouse Electric Corp., South Philadelphia, we found that welding positioners grouped radially around an automatic welding machine provide a much more efficient set-up than the old in-line arrangement where the welding machine has to be moved from one positioner to another. An ordinary material stacker was altered to carry the welding head, control panel and wire reel. The stacker has also been fitted with wheels that allow it to travel radially on rails mounted on a turntable.

This arrangement allows the welder to be rotated to face any one of the positioners, then elevated and moved towards the positioner where machine welding is required. While machine welding is being done at one positioner, the work may be placed on or removed from the other three positioners or hand welding to finish up can be done. The new set-up requires much less power and fewer feet of control cable than the old arrangement.

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GOOD EXAMPLES are these large fabricated pipes and fittings, made by Alaskan Copper Works, Seattle, Washington.

The large section of fitting on the right, 20″ dia., and the two branches, 14″ dia., were formed of .238″-thick Everdur sheet. In the group to the left, diameters range from 14″ to 18″, thicknesses from .203″ to .238″. All the seams were carbon-arc welded with Everdur 1010 Welding Rods. Incidentally, the welded Everdur pipe was hot formed over the steel flanges to make vanstone joints.

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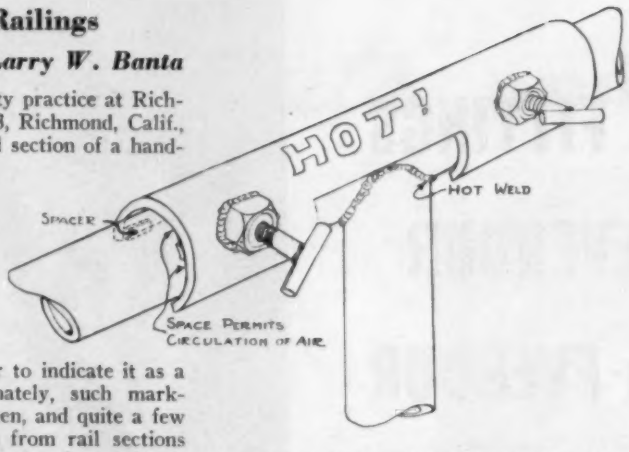
Sleeve for Hot Railings

By Larry W. Banta

IT WAS a common safety practice at Richmond Shipyard No. 3, Richmond, Calif., to mark a newly welded section of a hand-rail pipe "Hot" in order to indicate it as a danger zone. Unfortunately, such markings were not always seen, and quite a few workers suffered burns from rail sections left unattended immediately after welding. To afford safer operating conditions, I suggested to our Labor Management Committee that the region of the weld be adequately covered with a clamp-on sleeve painted red and marked "Hot." Adoption of the suggestion has greatly increased the safety of those working around the recently welded railings.



This sleeve is quickly clamped over the region of a fresh weld to prevent workers handling the pipe from being burned.

» «

Machining before Welding

By Joseph Lefkowitz

I MADE a suggestion to quicken production of war-needed Navy and Merchant Marine switchboards at the East Pittsburgh Works of the Westinghouse Electric Corp. and was awarded $1,733. It is estimated that my suggestion has resulted in an annual saving of $17,329 to the nation's war effort.

The idea came to me while I was directing the assembly and welding of steel frames destined to contain switchgear and control devices. We first welded together the framework and then drilled the mounting and tie-bolt holes one by one. I observed that the drilling operation was tying up badly needed machine-tool equipment; it also entailed much handling. I decided to have the holes punched through the various segments—front, side and cross pieces—prior to welding them together to form the frame.

Improvement over the old method was soon obvious. The new process permits us to utilize the faster punch presses to make the holes and hence releases a battery of drill presses for other duties. In addition, the welding job is made easier, and frequent handling of the heavy frames is eliminated.

Switchboard frames used to be welded and drilled, now they are punched and welded. A simple idea, yes, but it brought Inventor Joseph Lefkowitz an award of $1,733.

» «

Submerged-Melt Welding

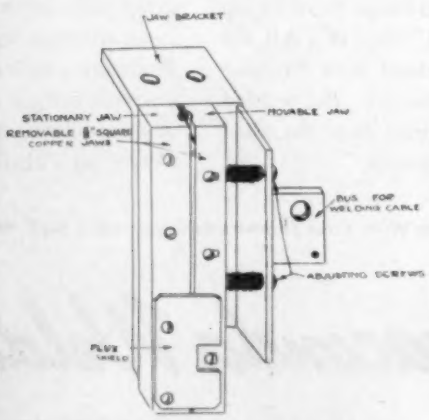
By Ernest Stone

THE jaws previously used on the "S" type head of submerged-melt welding machines were of tubular construction. The outer one of the two telescoping tubes was insulated with bakelite while the inside tube was split with springs that compressed the two halves together. The jaws were not exposed to the air; heat, therefore, was not allowed to radiate and the springs soon lost their tension. When this occurred, there was arcing between the two halves of the jaw and the welding wire. The arcing had a tendency to burn off the ends of the tube as well as to block the passageway of the welding wire, resulting in frequent breakdowns and jaw replacements.

To overcome these difficulties, I submitted to the Labor-Management Committee, Richmond Shipyard No. 1, Richmond, Calif., a proposal providing for the construction of two removable jaws of scrap copper ⅝ in. square. When positioned, one jaw is stationary while the other is movable. The tension of the welding wire is obtained by two springs that press against the side of the movable jaw. The pressure can be increased or decreased by adjusting the 8-32 screws, which also act as retaining pins for the springs. A protective shield to keep loose welding flux from entering the opening in the jaws is fastened to the stationary jaw and extends over the movable one. The welding cable bus is brazed to the jaw bracket, and the bracket itself is attached to the carriage and insulated therefrom.

The welding flux is fed onto the plate adjacent to the bottom of the jaws. Only a small portion of the jaws is submerged in the flux, and this serves as a great factor in reducing arcing. Arcing is also reduced by the fact that the jaws are exposed to the open air and allowed to radiate the maximum amount of heat.

The adoption of my suggestion is estimated to save about 40 man-hours of time on each ship, yet this type of jaw may be constructed for less than $10.



Improved jaws and bus for an "S" type head on a submerged-melt welder

» «

Sweaty welder's gloves increase the hazard of electrical shock. Here is how they are dried at Graham-Paige.

"Insulating" Welding Gloves

A NOVEL safety device at Graham-Paige Motors Corp., Detroit, is this handy mitt-dryer designed to protect the employees who weld Alligator amphibian tanks. Perspiration, having a high salt content, is a good conductor of electricity and so increases the possibility of shock to workers who handle electrical equipment. To eliminate the hazard, welding gloves are now rapidly dried before re-use. This is done by slipping them over narrow chimneys protruding from a metal cabinet which contains a heater and fan. Six pairs of gloves at a time receive the hot-air treatment from the all-welded mitt dryer.

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Kodak

On the Job

Brazing by Radiant Heat

A NEW method of supplying brazing heat —radiation from an incandescent filament—has been developed by technicians of the Westinghouse Electric Corp. The filament attains a temperature of over 3,600 F, heating the copper parts to about 1,650 F.

Ann Marks of the Westinghouse research laboratories brazes copper parts by radiation from an incandescent filament.

The accompanying picture shows copper parts being brazed in a hydrogen "bottle" by this method, which is now available to supplement the other brazing methods described in the article "Brazing Replaces Soldering" (page 50, this issue).

» «

Flame-Cut Cinder Car Racks

AN OXY-ACETYLENE shape-cutting machine enabled a midwestern steel plant to save more than 50% of the replacement costs of cinder car racks. This structure measures 5 ft by 4 in. by 2¼ in. and is used to hold the cinder car while it is being tipped to discharge its molten slag. Originally, the rack had been cast. To avoid the cost and delay involved in making a pattern and mold for the replacements, it was decided to flame-cut the parts from a steel slab 5 in. thick. Gear blanks were also cut from another part of the same slab, as the left picture below reveals.

A template for guiding the shape-cutting machine was sawed out of ¼ in. composition board. This substitute for the standard aluminum template strip was entirely satisfactory for this application because the template was to be used only a few times. The flame-cutting accomplished was sufficiently accurate so that no machining was necessary.

Total cost for both material and cutting was estimated at $18.30 for each rack; a new cast part would have cost $40. A still further saving was realized by the steel plant in storage costs since it is now unnecessary to stock these racks as replacements or to wait for their delivery when needed.

» «

Copper-Brazed Cam Followers

A SAVING of 13c per part on standard cam followers was effected at the Glenn L. Martin Co., Baltimore, through the adoption of a copper-brazing assembly method to replace cam followers machined in one piece from solid steel bar stock.

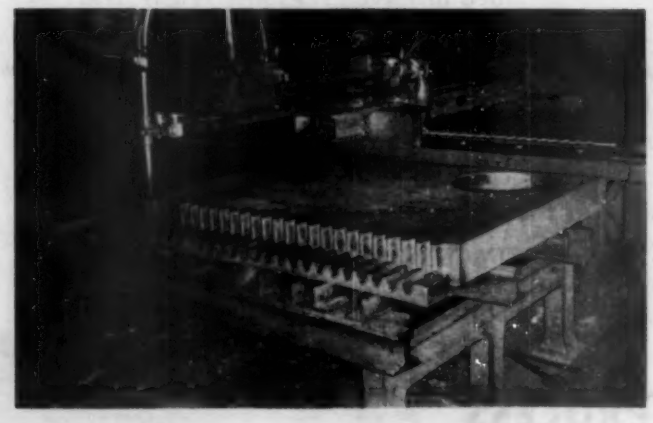
The assembled part consists of a rectangular flange with small tubular projections at each side from the center hole. The cylindrical portion of the assembly, a piece of stock steel tubing, is sized to the proper diameter and cut off in the screw machine. The rectangular flanged portion is blanked from strips of steel stock by a progressive die, the round hole through which the cylinder passes being blanked and sized in the same operation.

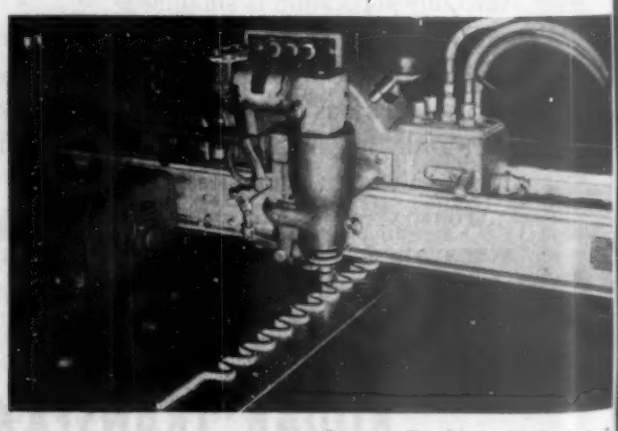
The cylindrical portion is slipped into the flange hole, and the assembly is placed on a part holder. A ring of copper-brazing alloy is placed on each assembly at the joint. The parts holder is loaded with assemblies (see picture) and placed in an electric furnace for brazing. The copper ring melts and creeps into the joint by capillary attraction, resulting in a strong, clean joint.

Rings of copper-brazing material are slipped over the assemblies on the part holder. The copper melts in the brazing furnace and is drawn into the joint by capillary attraction.

Under the old method, the followers were "sculptured" from round bar stock on a screw machine. The parts were roughed and finished to the proper diameter; the center hole was drilled and reamed; two small holes in the flange were drilled and

Left: the cutting machine and the completed rack. A pair of racks are made with each single cut. Note also that gear blanks were cut from another part of the slab, using the same machine. On the right is a view of the template guiding the cutting torch. This template was ingeniously cut out of composition board.





Courtesy, The Linde Air Products Co.

burred for attaching the part to the next assembly, and a final operation was required to blank off both sides of the round flange to make it rectangular.

Tests revealed that the new-type followers had strength beyond any previous design requirements.

» «

Fire Extinguisher Placement

WHEN providing general protection for an area containing normal fire hazards, portable fire extinguishers should be so placed that at least one large or two small ones can be reached by traveling no more than 50 ft from any point in the area, advises the Safety Research Institute, Inc., New York City. When the extinguishers are used for safeguarding a specific fire hazard, they should not be mounted on that hazard or so close to it that they will be involved if it catches fire.

In a relatively small room, it is good practice to mount extinguishers just inside or outside of doorways. They may be mounted on columns or walls, but the tops of easily handled units should not be more than 5 ft from the floor. Tops of heavier units should not be more than 3½ ft from the floor.

Extinguishers should always be placed where they can be plainly seen—if they have to be wholly or partly concealed, the locations should be plainly marked.

» «

Then and Now

EVIDENCE of the pace at which arc welding has advanced during the past 28 years is provided by the pictorial comparison below of a 1917 welder with one of 1945. The 400 amp welder of 1917 weighed 3,500 lb and was priced at $2,000. Today's version weighs only 1,200 lb and costs slightly over $400.

The welder of World War I (upper picture) dwarfs a modern unit—in size, not capacity.

Courtesy, The Lincoln Electric Co.

Here's a test for:

Ductility

Strength

Torsion

● *Two 1" square bars spaced 12" apart . . . space deposit-filled with Titan Bronze Welding Rod, machined to dimensions of the steel . . . then on lathe and twisted 720 degrees in the bronze and 90 degrees in the steel—WITHOUT FAILURE.*

this result is typical of

TITAN BRONZE WELDING RODS

● The excellence of Titan Bronze Welding Rod is due in part to 99.96 to 99.99 percent purity of all raw materials—to melting in highly controlled electric furnaces—to double deoxidation which effectively removes all occluded and dissolved gasses and prevents absorption of gasses during the welding operation.

All Titan Rods may be used as general purpose rods, but there are three groups, covering seven characteristically different types of Rods, each alloyed and produced for a definite purpose. All flow freely at 1625°F, with excellent permeation of seams and crevices, producing sound, strong, tough, non-porous welds.

Titan literature on this subject is complete and informative. Write for it; ask for recommendations if desired.

Titan

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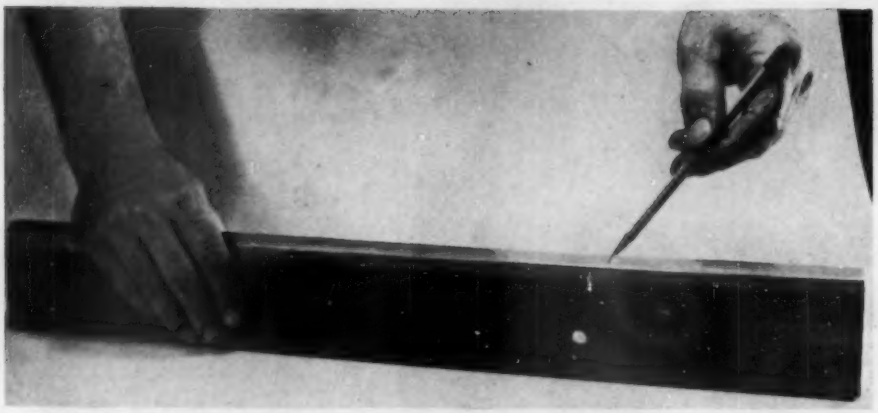


Courtesy, Ampco Metal Co.

An overlay of aluminum bronze on the guide blade (work rest) of a centerless grinder enabled stainless-steel pump shafts to be ground without galling or scratching.

Overlaying Guide Blades

By Herb Hose

STAINLESS-STEEL pump shafts had to be ground on a centerless grinder. The shafts were 5/8 in. in diameter by 12 in. long, and they had to have from 0.016 to 0.020 in. ground down over the entire length. It was found that the job could not be done satisfactorily with the guide blades used for grinding other metals. The stainless-steel shafts tended to stick to the blade, resulting in scratch marks and an irregular finish having many high and low spots.

Various types of blades were tried in attempts to do the work. Among the failures were blades of cast iron, tool steel and special blades with high-speed insets. Finally, the superintendent of the plant, reasoning that a dissimilar metal of high hardness and good bearing qualities would withstand the excessive friction, decided to try aluminum bronze.

A 1/8 in. aluminum-bronze rod producing a Brinell hardness of about 250 was applied to a depth of 1/4 in. as an overlay for the bearing surface. The base plate was of 1040 steel and measured 1/2 by 4 by 24 in.—the same size as the regular guide blades. The 1/4 in. depth was sufficient to permit several recuts of the overlay to compensate for the wear resulting from the regular grinding operations.

The overlaid blade was properly machined and put into service. It was found that the stainless-steel shaft could be ground without the slightest galling or scratching of either the shaft or overlaid surface. The blade was used to make 7,800 passes, completing the job, and was then removed to be miked. It was discovered that a groove of about 0.016 in. deep had been worn in the overlaid surface; this was removed by grinding to put the blade back into its original shape.

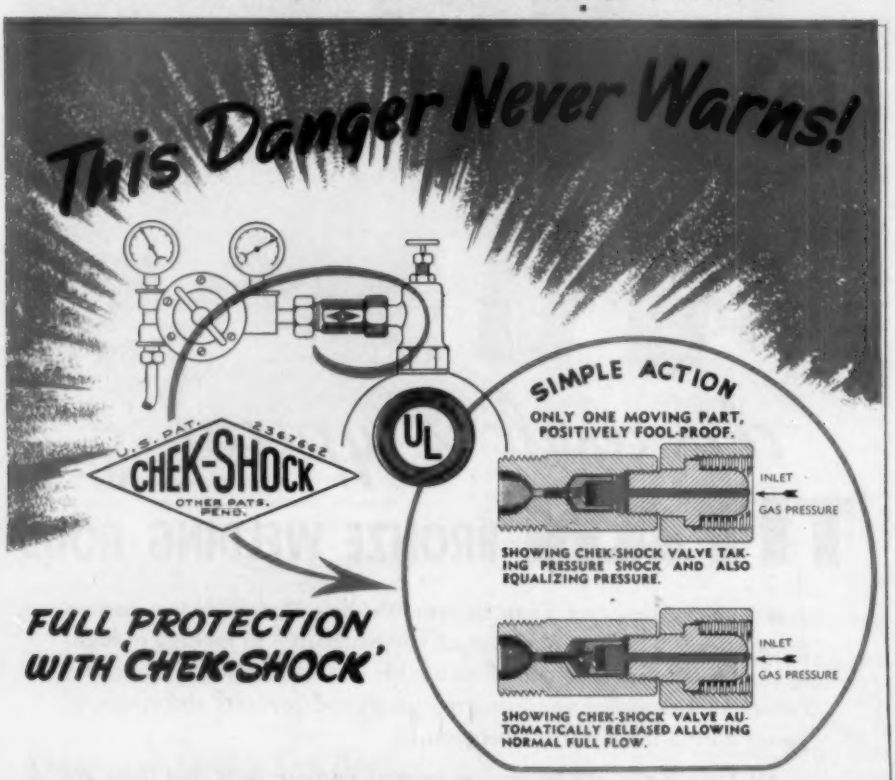
» «

Heavy-Duty Flash Welding

FEW PEOPLE realize how extensively the various resistance-welding processes had found application in the production of tank parts—turret rings, crank shafts, engine valves, fuel containers, bogey wheel rims, tank treads, machine gun receivers, cannon mechanisms . . . even some of the ammunition was resistance welded.

An example of the equipment required for heavy-duty tank welding is a 1,000 kva flash welder that was especially designed for the flash-butt welding of heavy tank turret rings. This model was equipped with four sets of interchangeable welding dies for rings ranging in size from 69½ to 80¾ in. OD and weighing from 700 to 1,000 lb. These rings were made of special high-carbon, manganese alloy steel. The cross-sectional areas ranged from 9½ to 15½ sq in., but the machine has capacity for welding a maximum cross-sectional area of 18½ sq in. of this alloy or much larger cross sections of mild steel. The welder has an available upsetting pressure of 378,000 lb and 1,000,000 lb clamping pressure, operating from a 2,000 lb hydraulic pressure system.

Normal production of tank turret rings was from nine to twelve completely welded rings per hour.



CHEK-SHOCK OXYGEN CUSHION VALVE

SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- **Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.**
- **Will increase life of regulator assembly.**
- **Will eliminate possible injury to operator from burstings.**
- **Will prevent unnecessary internal wear in regulator *(as NOT necessary to release control screw before opening tank valve).***

This PROVEN automatic safety device cushions the initial "blast" of pressure when tank valve is turned on, (this uncontrolled surge which strikes like a hammer is the direct cause of most damaged regulators and accidents), when pressure slowly bleeds and equalizes then CHEK-SHOCK allows a full flow of oxygen.

PRICE IS LESS THAN ONE REPAIR BILL

 # 1. STANDARD COUPLER—for all standard size welding type oxygen regulators.
 # 2. LIGHT COUPLER—for "airplane" or soldering size oxygen regulators.
 # 3. HEAVY DUTY COUPLER—recommended for extra heavy duty work only.
 # 4. SCREW TYPE COUPLER—for removable inlet stem regulators (1/4" pipe) available in standard, light, or heavy capacities.
 # 5. FOR HYDROGEN—left hand thread coupler. We also make Medical Chek-Shocks for all types of medical regulators and tank fittings (chrome plated).....$7.00 each

$6.00 ea.

SEE YOUR DISTRIBUTOR OR WRITE

Chek-Shock MFG. CO.
FOWLER CALIF.

For superior welding with alternating current use these RACO ELECTRODES

ELECTRODES FOR ALL-POSITION WELDING

High Ductility—Deep Penetration Type	
RACO Type	A.W.S.—A.S.T.M. Cla
RACO 11	E 6011
RACO 7011	E 7011
RACO 9011	E 9011
RACO 10011	E 10011
Poor Fit-up Type	
RACO Type	A.W.S.—A.S.T.M. Class
RACO 8	E 6012
Sheet Metal Welding Type	
RACO Type	A.W.S.—A.S.T.M. Class
RACO 13	E 6013

★

ELECTRODES FOR POSITIONED WELDING

Horizontal Fillet Type	
RACO Type	A.W.S.—A.S.T.M. Class
RACO 20	E 6020
RACO 64	E 7020
RACO 10020	E 10020
Flat-Position Type	
RACO Type	A.W.S.—A.S.T.M. Class
RACO 5	E 6030

With the increasing popularity of transformer welders of all types, the demand for A.C. electrodes for welding mild steel and high-tensile, low-alloy steels is steadily mounting. The outstanding advantage of alternating current for welding is, of course, the practical elimination of magnetic arc blow. For this reason, A.C. electrodes are especially desirable in assemblies involving intricate corner welding, gapped seams, or under other conditions favoring arc blow.

All the above electrodes give excellent results when used with direct current. Samples on request.

The REID-AVERY COMPANY
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Testing Welding Tees

THE first welding tees were made by cutting a hole in a piece of pipe and welding a nipple at right angles to its run. This did not provide adequate strength in a great many cases; other objections were the presence of icicles or slag on the inside of the pipe and the sharp change of direction imposed on flow through the pipe.

A forged welding tee was developed by Tube Turns, Inc., Louisville, to overcome these defects. In developing the design, the stress-coat method was used to locate the areas of greatest stress. Lacquers were applied to the surfaces of experimental tees; internal pressure caused the tee to expand and the lacquer to crack at the points of greatest stress. The weaknesses thus found were corrected by adding extra metal as needed to bring about a uniform strength.

One of the results of hydrostatic bursting tests on the final design is shown in the picture. The welds and the welding fitting withstood the hydrostatic test, but the branch pipe, it was found, did not.

This is what happened to the branch pipe when a welding tee was given a hydrostatic bursting test.

Courtesy Tube Turns, Inc.

» «

Chain Drive Guards

By Charles C. Lynde

AN OILFIELD contractor used a single gasoline engine to drive all of his skid-mounted and unitized auxiliary equipment—lighting generator, air compressor and water pump. The twin chain drives and flexible coupling of the system formed a hazard which seriously menaced the safety of the men working in the vicinity.

The company weldor was assigned the task of providing protection over the drives without hampering inspection or maintenance. He began by welding stub sections to the steel subbase of the unit and fitting them with rectangular covers of the same overall dimensions. Locking or registering devices were provided by welding narrow strips at the ends, both inside and outside the cover. These strips retained the covers in place and also served to direct within the case any lubricant thrown off the chains.

A similar cover was made for the universal joint between the drives; this unit was fitted with retention lugs that prevented motion toward either bearing or motion out of alignment with the joint.

Handles of ½ in. bar stock, welded at the tops of all covers, made it possible to remove the covers easily and without cramping at the interlocking surface.

The twin chain drives and flexible coupling of this system were covered with easily removable welded guards.

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Between the covers of this new Burdox catalog—just off the press—you will find practically every product and accessory you need for welding and cutting. Over 60 pages illustrated and fully indexed, showing the latest developments in arc welding and gas welding equipment as well as a complete line of safety equipment such as goggles, helmets and faceshields. You'll save time and money and get better service by having this new Burdox catalog at your fingertips. Send for your free copy today!

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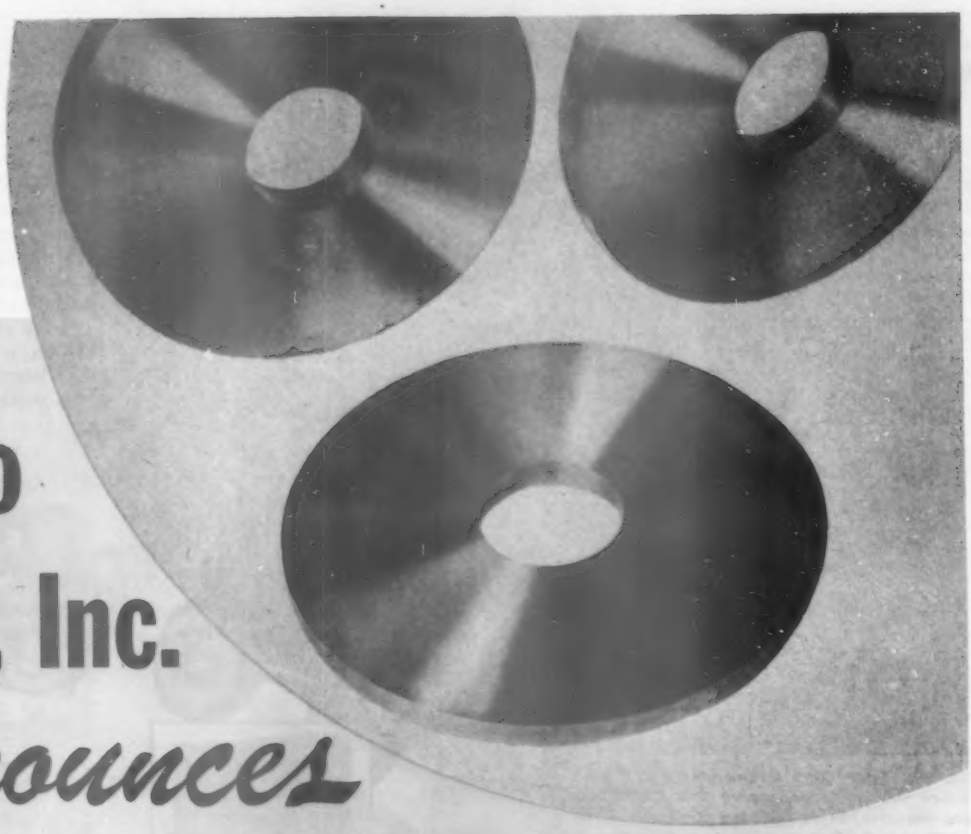


Ampco Metal, Inc. *Announces* a line of Resistance Welding

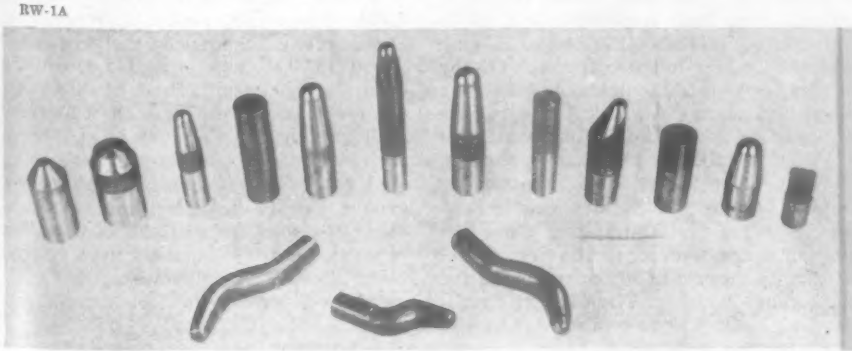
Seam Welder Wheels | **Spot Welder Electrodes**

Ampco's wealth of experience in the field of non-ferrous alloys, led to the development of high conductivity alloys used in the Resistance Welding Industry.

At Ampco, control of quality and uniformity of product — both absolutely necessary in this exacting field — are kept under close supervision of laboratory technicians from the receipt of the new material through production of the finished part. There is no lost time adjusting current, time, or pressure with Ampcoloy electrodes because physical properties for each grade are dependably uniform.

We are prepared to supply spot welder electrodes in standard R.W.M.A. sizes, (special sizes on request) — standard seam welder wheels in 4 to 10 inch diameters inclusive (special sizes on request), seam welder shafts and bushings — flash butt and projection welder dies — standard size rounds (rectangular sizes will be furnished on request). Complete details given in Bulletin 68. Write today.

RW-1A



Ampco Metal, Inc.
Dept. WE-9 Milwaukee 4, Wis.
Ampco Field Offices in Principal Cities

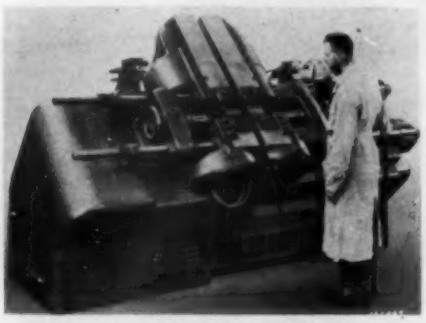
AMPCO

New Products to Use

Flash Welders

★ An entirely new line of flash-butt welders in five standard sizes is announced by **Progressive Welder Co.**, 3050 E. Outer Drive, Detroit 12. The machines range in electrical capacities from 20 to 250 kva. The five basic sizes are classified and rated according to recommended specifications of the Resistance Welder Manufacturers' Association.

The design of these machines permits them to be furnished for hand, air, hydraulic or motor operation. If desired, the work-clamping fixtures can be operated by one method and the platen traverse by a different method; for example, work clamping can be air operated and flash and upset hydraulically operated on the same machine without change in the basic design. The controls may be manual, semiautomatic or fully automatic, according to the nature of the work to be done.



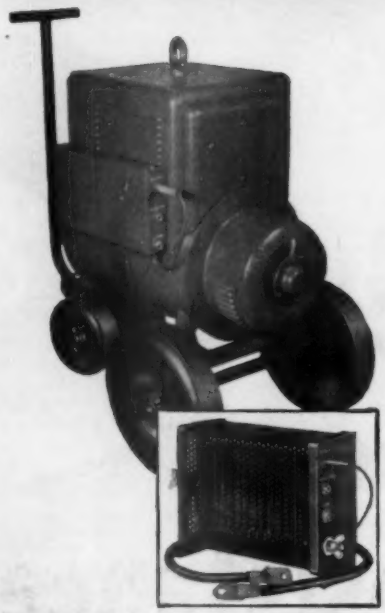
The new Progressive flash welders are built in five standard sizes ranging from 20 to 250 kva capacity. Large T-slotted platens may be either horizontally or angularly mounted.

These machines are fitted with large, flat T-slotted platens designed to accommodate a wide range of interchangeable dies to hold virtually any size or shape of workpiece. The three larger sizes are available with platens mounted in either the standard horizontal position or at an angle of 45 deg. The platens are mounted on heavy steel rails and slide on electrically insulated antifriction bearings of erosion-resisting material.

» «

"Ampco-Trode" Sampler

★ A sampler package of "Ampco-Trode" coated aluminum-bronze electrodes is being offered at reduced prices to familiarize the welding industry with this product. The package contains a selection of the five grades of the rod in three sizes: 1/16, 3/32 and 1/8 in. One of these grades, "Ampco-Trode 10," is designed to weld dissimilar metals and is said to be especially suitable for welding manganese bronze. Other grades are applicable to overlays, building up of shafts, wear strips, forming and drawing dies, refacing for wear resistance, etc. **Ampco Metal, Inc.**, 1745 S. Thirty-Eighth St., Milwaukee 4.



"Thinweld" attachment to facilitate the welding of light-gauge sheets. It makes possible the use of low amperages—as low as 10 amp—without any dead spots in the welding range.

Light-Welding Attachment

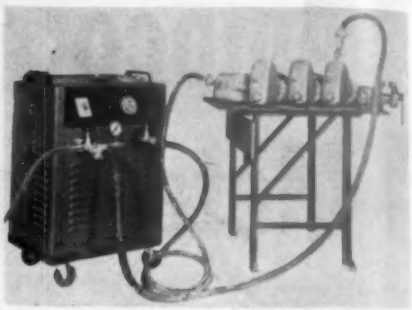
★ Fabricating plants and job shops in which the work may vary from extremely heavy plate to very light-gauge sheets should find many uses for the new three-step "Thinweld" attachment for arc welders. This device may be installed on any standard arc welder (No. 413) or is installed on Hobart arc welders at the factory (No. 412). It is said to make it possible to weld from 10 amp to the maximum rating of the welder without the occurrence of any "dead spots."

The No. 413 attachment is furnished with a 3 ft cable to be connected to the ground terminal of the welder. The ground lead is connected in turn to the wing nut on the "Thinweld." By plugging the jack into the three alternative positions, it is possible to get three additional ranges of amperage: low, 10-20 amp; medium, 15-30 amp; high, 25 amp up to the minimum capacity of the welder. Intermediate points between the low, medium and high positions can be obtained by use of the field rheostat.

When installed at the factory, the No. 412 attachment is attached permanently on the back of the welder and is connected to the first and second ranges of the ten range switch. In the first range, it permits the use of lower amperage for light-gauge welding. **The Hobart Brothers Co.**, Hobart Square, Troy 1, O.

Unit for Casting Repair

★ Castings rejected because of porosity or pinhole cracks can be salvaged with the Mogul "Circulator Model M-1500" and Mogul "Cast-Seal" solution. The circulator forces the heated solution under pressure into a crack, where colloidal action causes it to build up in successive interlocking layers until a bond which will effectively seal the opening has been formed. Castings reclaimed by this method were tested under pressures up to 200 psi with hot kerosene, hot oil, hot water and other solutions; it was found that the former porosity and leakage from pinhole cracks had been entirely eliminated, states manufacturer.



Set-up for sealing porous castings with the Mogul "Circulator."

The circulator cabinet houses a 15 gallon tank with an electric immersion heater and an electrically driven turbine-type pump of 30 gpm capacity. An automatic switch maintains the pressure at the setting required by the operator. Other equipment includes an automatic thermal switch to protect the heater and the motor from overheating, 12 ft of heavy-duty electrical cable, two 12 ft lengths of heavy-duty safety hose for attachment to the casting as well as 12 ft of air hose with connector, air pressure gauge, and air control petcock for pressure testing. **The Metallizing Co. of America**, 1330 W. Congress St., Chicago 7.

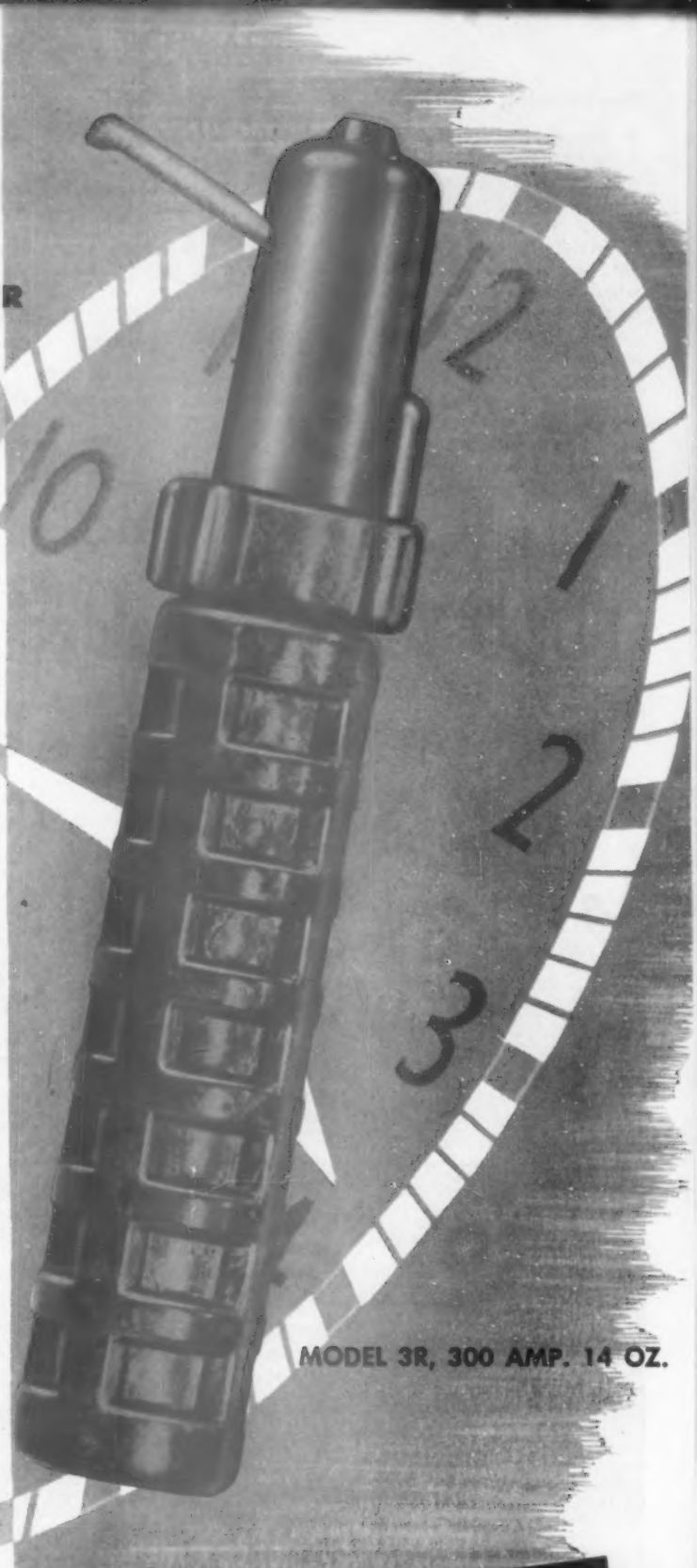
» «

Valve-Facing Alloy

★ A new valve-facing material capable of standing up under a test run of 200,000 miles has been developed by the Wilcox-Rich Div. of the **Eaton Mfg. Co.**, Detroit. "Eatonite," the new alloy, contains nickel, chromium, cobalt and tungsten. It will retain hardness in the "red zone" above 1,000 F and will also resist the corrosive chemical action of the compounds released during combustion by antiknock fuels. Eatonite is applied to the valve face by an oxy-acetylene welding process which bonds the alloy in a groove cut in the valve head. In passenger automobiles, at least 100,000 miles of service may be expected from refaced valves, states manufacturer, as compared to a present limit of about 30,000 miles.

MARTIN WELLS' *Stubby* HOLDER

Gives more ARC time



MODEL 3R, 300 AMP. 14 OZ.

100% Insulated; Cuts Down Accidents

1. Stubby, with new "Mitt-Grip" collar, makes rod changing easier and quicker. Collar lasts indefinitely. Insulator cap may be replaced without changing collar and without special tools. So, Stubby spends more time on the job, less in the repair shop.
2. Higher electrical conductivity, due to special construction of vise body, delivers *full amperage* to the rod. Sturdy, but lightweight construction protects Stubby when overloaded.
3. Stubby's perfect balance, due to streamlined design and light weight, helps operator maintain high weld-footage throughout the shift. Because it is 100 per cent insulated, Stubby does not have accidents.
4. Stubby's high pressure grip holds rods firm, enables operator to use rods down to the last 1½". Stubby has no springs to get tired.

Stubby WILL GIVE YOU MORE ARC TIME

AIR REDUCTION—NATIONAL DISTRIBUTORS

REGIONAL DISTRIBUTORS

BAY CITY—Northern Supply Company
BIRMINGHAM—Ebbert & Kirkman Co. Inc.
CEDAR RAPIDS—L. B. Lamb Sales Co.
CHICAGO—Steel Sales Corp.
CINCINNATI—Williams & Co. Inc.
CLEVELAND—Williams & Co. Inc.
COLUMBUS—Williams & Co. Inc.
MILWAUKEE—Steel Sales Corp.
DETROIT—Steel Sales Corp.
Weldit Acetylene Co.
HOUSTON and throughout TEXAS—
Magnolia Airco Gas Products Co
HONOLULU—Hawaiian Gas Products, Ltd.
MINNEAPOLIS—Steel Sales Corp.
MONTREAL—Budet Machinery Co
NEW YORK—Chicago Combustion Co.
VANCOUVER, B.C.—Scott-Foster & Co.
OMAHA—The Bolbach Company
Fuchs Machinery & Supply Co.
PHOENIX—Arizona Welding Equipment
PITTSBURGH—Williams & Co. Inc.
SAGINAW—Northern Supply Co.
ST. LOUIS—Steel Sales Corp.
SAN FRANCISCO—Pitts & Loughlin
SPOKANE—Gibson Welding Supply Co.

"More Arc Time"
Martin Wells
ELECTRODE HOLDERS
Los Angeles 1, California

Hard-Facing Electrodes

★ To supplement Stoody 1 and Stoody 6 non-ferrous hard-facing rods for oxy-acetylene application, this manufacturer has developed Coated Stoody 1 and Coated Stoody 6 for hard-facing by the arc-welding process. These electrodes are used on heavy equipment or intricate parts which cannot be satisfactorily hard-faced by the oxy-acetylene hard-facing process. Typical applications include: vegetable and fish oil expeller parts, heavy hot punches, capstans, heavy blades for cutting scrap or shearing hot steel, blast furnace bleeder valves, blowing engine gas valves and seats, heavy mill guides hot trimming dies, blanking dies, forming dies, stoker screws, coke oven push shoes, hot clinker conveyor screws, etc.

Because of its high hardness and wear resistance, Coated Stoody 1 is generally applied where resistance to sliding abrasion is of major importance. Coated Stoody 6, having greater ductility, is preferable for parts subject to impact. **The Stoody Co.**, 1141 W. Slauson Ave., Whittier, Calif.

» «

A-C Welder

★ A new 200 amp Wilson "Bumblebee" transformer-type welder is featured by built-in capacitors said to make possible power economies up to 35%, relieving overloaded transmission and plant feeder lines. There are two current ranges: low from 30 to 110 amp and high from 90 to 275 amp. Continuous stepless current control is provided by turning the

Wilson 200 amp "Bumblebee" for medium-capacity a-c welding.

crank on the top. A full-view scale makes current settings easy to read.

This welder is sturdily constructed, all windings being covered with heat-resistant spun-glass fibre insulation. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

Underwater Electrode

★ An underwater cutting electrode suitable for use at unlimited depths has been developed to facilitate the salvage of damaged ships endangered by large masses of bent and twisted armor plate. The "Ellpro" electrode is made of steel in the form of a hollow tube and has an adhesive-type coating which prevents it from sticking to the cutting surface. It is used with oxygen, which escapes from the water in a comparatively quiet manner and does not reveal the location of the cutting to enemy patrols. Although designed primarily for underwater cutting, it is easily adapted to cutting scrap iron or steel, salvaging sunken marine equipment and rehabilitation work in war-torn cities and towns. It can be used anywhere on land or under water with either a-c or d-c welding equipment. **Ellwood Products Corp.**, Ellwood City, Pa.

» «

Antifog Preparation

★ Fogging on goggle lenses, face shields and welding plates may be minimized with the new AO antifog material, designed to penetrate the ultramicroscopic pores of glass. It is deposited on the surface of the glass in a thin film, which helps to prevent fogging, steaming and frosting and in addition removes grease and dirt. The preparation is easily applied by simply spreading it on both inner and outer surfaces of the goggles, rubbing the surfaces thoroughly and then polishing them with a soft cloth or paper. **American Optical Co.**, Southbridge, Mass.

EDCO Yellow Shielded

Phosphor Bronze

ELECTRODES

18" length with Center Grip
14" length with End Grip

Edco yellow shielded electrodes have a soft, stable arc, low splatter, sound metal, and can be manipulated readily. The repair and fabrication of vital war equipment with Edco Electrodes have won them high praise from military personnel... Write or wire for your nearest distributor.

SOLE MANUFACTURER

ECCLES & DAVIES

MACHINERY CO., INC.

1910 Santa Fe Avenue · Los Angeles 21, California

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Quality Welding...Requires

UNIFORM TRAVEL SPEED
SELECTED ELECTRODE
CORRECT CURRENT

To melt the electrode properly, according to established tables, FULL current value must be delivered from the generator to the point of fusion. Welding cable is the current conductor and must be the correct size to prevent power loss, slow down production, and poor welding.

FOR QUALITY PRODUCTION CHOOSE - - -

"MAJOR"
WELDING CABLE

SIZES AVAILABLE:

Size	Strands	Amps.
6	950	75
4	1029	125
3	1323	150
2	1666	200
1	2156	250
1/0	2646	300
2/0	3381	375
3/0	4284	450
4/0	5376	550

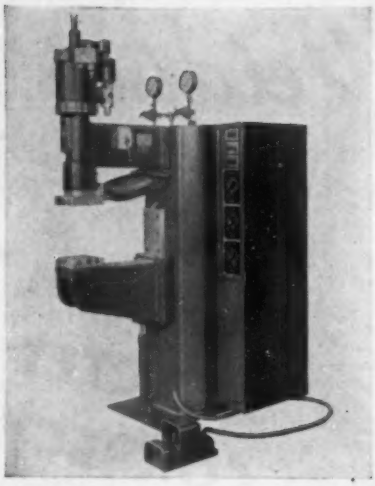
THE conductor is composed of spirally wound strands of fine copper wires and is flexible. Heavy paper separator between conductor and exterior covering is additional insulation against power loss-strips quick and clean for attaching to lugs. W.P.B. approved synthetic rubber covering is extruded type-continuous vulcanization processed, and adds to flexibility.

WELDING ENGINEERING COMPANY
MILWAUKEE, WISCONSIN
MANUFACTURERS — DISTRIBUTORS
OFFICES AND AGENTS ALL OVER THE UNITED STATES

Projection Welder

★ The advantage of forging pressure is provided in a new 150 kva Sciaky projection welder. The initial low pressure during the flow of welding current is sufficient to establish good contact but low enough to prevent the projections from being crushed. A forging pressure of higher value follows immediately after the passage of welding current; the quick follow-up is said to reduce brittleness and sheet separation and to assure uniform welds with a minimum of power.

This welder, type PMCO1-9, is a self-contained unit with electronic controls mounted in a hinged cabinet convenient to the operator. It may be easily converted from projection to spot welding by replacing the dies with electrode holders. As a projection welder, it has a capacity of six projections on 0.080 in. mild steel. As a spot welder it can handle two thicknesses of material ranging from 0.032 to 0.187 in. Throat depth is 18 in., with maximum working space of 21 in. between the arms. Maximum pressure is 2,600 lb for a 91 psi line. **Sciaky Brothers**, 4915 W. 67th St., Chicago 38.

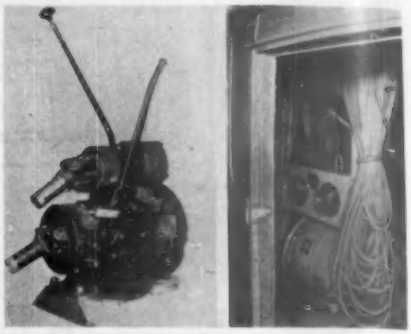


Sciaky PMCO1-9 projection welder. It has a pressure sequence consisting of initial low pressure and postweld forging pressure.

» «

Power Take-Off

★ A new power take-off unit is direct connected to the truck motor, eliminating the conventional V-belt drive. It can be installed in any Ford or Dodge truck as a permanent set-up or removed and reinstalled in a few minutes. The driving mechanism fits directly over the standard transmission case and does not interfere with the truck's normal use.



Power take-off unit for truck motor. The welder generator and supplemental equipment are compactly positioned behind the truck cab.

This unit is said to provide an economical and convenient method for supplying power from the truck motor to operate a welding generator. The speed of the generator is the same as that of the motor but can be varied if necessary with special gear ratios. The governor, which can be cut in or out quickly, is connected with the power take-off. **A. Tangen**, 3269 Hogarth, Detroit.

» «

Aluminum Flux

★ "Flo-Well" No. 1, an improved free-flowing aluminum flux, is offered to gas weld wrought, cast or high-tensile aluminum and aluminum alloys of any size or shape. It is packaged in containers of ¼ to 25 lb and may also be purchased in ton lots. Samples and instructions for use will be forwarded upon request to manufacturer. **A. K. Mauk**, 7541 Hamilton Ave., Pittsburgh 8.

"Flo-Well" flux is easily handled, quickly applied on aluminum and aluminum alloys.

(Please turn to page 78)

SIMPLE ARITHMETIC . . .

It's easy to figure why G-R welders cut production costs . . . just add up these savings:

1. **Lower power costs when welding . . .** G-R's high efficiency (as high as 94.6%, as against 40-50% for generator sets) means you get MORE welding out of every kilowatt of power consumed.
2. **Lower "standby" cost during non-welding periods . . .** G-R's use of low-loss transformer steel cuts power consumption when the welder is "on" but not welding to a fourth that of motor-generator sets.
3. **Faster welding . . .** with no magnetic blow, you can use higher heat with faster burn-off and increased rate of deposit to get MORE WELDING DONE EVERY HOUR.

G-R's are available in standard models from 100 to 2,500 amp. ratings, for manual or automatic welding. For details, prices and delivery information, see your nearby G-R distributor, or write directly to:

GLENN-ROBERTS COMPANY
3100 E. TENTH STREET • OAKLAND 1, CALIFORNIA
2107 ADAMS STREET • INDIANAPOLIS 1, INDIANA

New ELECTRONIC CONTROL FOR SMALL RESISTANCE-WELDING JOBS

This new G-E electronic heat control used with a small bench welder is an important factor in the high production rate attained in the welding of electronic tube parts.

WHAT IT OFFERS YOU

1. Synchronous Precision Timing
   a. Easy, accurate adjustment
   b. Uniform results
2. Electronic Heat Control
   a. High production
   b. Little or no distortion of material
   c. Satisfactory welding of small difficult-to-weld parts

NOW you can be certain that your low-capacity spot welders will be precisely controlled, insuring better welding results. When connected to a suitable transformer, this control, used either on a bench welder or with welding tongs, makes an ideal combination for welding of all sorts of small parts. A good example of this is in the welding of tube parts where tungsten, fernico, copper, tantalum, magnesium, and molybdenum are constantly being welded with good results.

Synchronous Precision Timing

You know that accurate control of weld time is essential to the consistent welding of small parts, because the optimum weld time for high production and little distortion is less than ten cycles. In fact, it is often only one or two cycles.

Synchronous precision timing enables you to adjust the weld time in one-cycle steps from one to ten cycles. Also, with this type of timing you are assured that the preset timing will be exact (no deviations from weld to weld).

Electronic Heat Control

You also know that, in welding small parts, it is vital to have a means of adjusting the current to very close values, as relatively slight changes in welding current will result in either no welds, weak welds, or burned parts. Adjustable electronic heat control provides the necessary preciseness of current control for welding small parts—especially those metals and alloys which are difficult to weld consistently.

Flexibility of Operation

This equipment is suitable for operation on either 230- or 460-volt, 60-cycle power supply. Because the tubes have the same current rating on either voltage, the transformer that is used on a 460-volt supply can be twice as large as that required on a 230-volt source—this will approximately double the secondary or welding current.

How This Control Can Help You

If you're doing small welding jobs, this control can undoubtedly help you speed up production by providing precise welding control, and thereby reducing rejects. Our local office will be glad to send you further information on the CR7503-A140A2 timer, or talk over the possibility of installing these controls on your assembly line. However, if you prefer, write directly to General Electric Co., Schenectady 5, N. Y.

RESISTANCE-WELDING CONTROL

GENERAL ELECTRIC

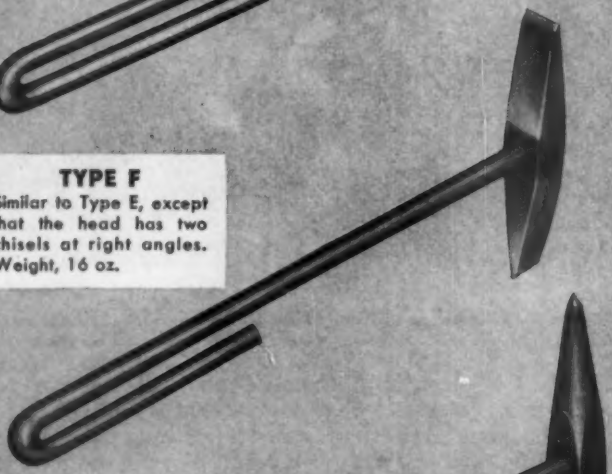
Buy all the BONDS you can—and keep all you buy

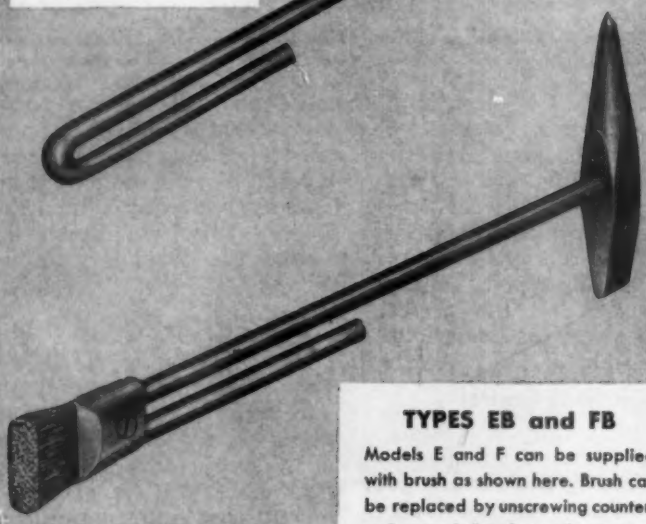
For Every Weld Cleaning Need

NEW MODELS WITH STEEL HANDLES

TYPE E
Head, made of high-grade ¾ inch square tool steel, has a combination drift and chisel for general chipping purposes. Handle, of ⅜ inch round steel, has a special hand grip to absorb shock when chipping and to hook on welder's belt when not in use. Weight, 16 oz.

TYPE F
Similar to Type E, except that the head has two chisels at right angles. Weight, 16 oz.





TYPES EB and FB
Models E and F can be supplied with brush as shown here. Brush can be replaced by unscrewing countersunk screw in bracket and removing.

CMD

WELDER'S CHIPPING HAMMERS

Offer Advanced Features at Moderate Cost

WRITE DEPARTMENT 9W
For Descriptive Circular

MODELS WITH WOODEN HANDLES

TYPE A
DRIFT AND CHISEL
Made from high-grade tool steel. Especially popular in malleable iron and grey iron foundries for general chipping.

TYPE C
DRIFT AND CHISEL
Same as Type CB but without brush.

TYPE CB TRIPLE DUTY
Combines 3 tools in 1—drift, chisel, and removable wire brush.

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1928 West 46th Street • Dept. W • Chicago 9, Illinois

R. F. and Induction-Heating Formulas*

General R. F. Heating Formulas

1. Load Thermal Power Requirement

$P_{kw} = 2.93 \times 10^{-4}\ MC \triangle T$ (kilowatts).

P = load thermal power requirement.
M = lb/hr of material to be heated.
C = specific heat of substance.
$\triangle T$ = temperature rise in degrees F.

2. A-C Resistance of a Conductor

$R = .405\sqrt{f}\, d R_{dc}$ (ohms).

R = A-C resistance of conductor.
f = frequency in cycles/sec.
d = diam of conductor inches.
R_{dc} = D-C resistance of a solid conductor of equal diam.

3. Capacitive Reactance

$$X = \frac{1}{wC} \text{ (ohms)}.$$

X = capacitive reactance (ohms).
w = 2π f.
C = capacity (farads).
f = frequency (cycles/sec).

4. Radiation and Convection Loss from Surface (Thermal Losses)

$$w_r = 37e\left[\left(\frac{T_1}{1000}\right)^4 - \left(\frac{T_2}{1000}\right)^4\right]$$

watts/sq in.
w = .001$\boxplus$ 4/3 watts/sq/in.
T = 5/9 F + 255.4.
F = degrees Fahrenheit.
$\boxplus$ = 5/9$\triangle$ F.
e = relative emissivity = 1 for black body radiation.

5. Inductive Reactance

$X = 2\pi$ fL ohms.
X = inductive reactance (ohms).
f = frequency cycles/sec.
L = inductance in henries.

Induction-Heating Formulas

1. Power Input into a Non-Magnetic Cylinder

$$\dagger P_v = \frac{16.3 H_o^2}{d}\sqrt{fp} \times 10^{-7} \text{ (watts/cu in.)}.$$

P_v = power density in watts/cu in.
H_o = peak magnetizing force (oersteds).
p = resistivity of material in microhms-cms.
d = outside diameter of cylinder in inches
f = frequency in cycles/sec.

2. Power Input into a Non-Magnetic Slab

$$\dagger P_v = \frac{8.15\, H_o^2\ \sqrt{fp} \times 10^{-7}}{t} \text{ (watts cu/in.)}.$$

P_v = power density in watts/cu in.
H_o = peak magnetizing force (oersteds).
p = resistivity of work in microhms-cms.
t = thickness of slab in inches.
f = frequency in cycle/sec.

3. Power Input into a Magnetic Cylinder

$$\dagger P_v = \frac{2.75 \times 10^{-4}}{d}\sqrt{pf}\, H_o^{3/2} \text{ (watts cu/in.)}.$$

P_v = power density in watts/cu in.
d = diam of cylinder in inches.
p = resistivity of work in microhms-cms.
f = frequency in cycles/sec.
H_o = peak magnetizing force (oersteds).

4. Power Input into a Magnetic Slab

$$\dagger P_v = \frac{1.37 \times 10^{-4}}{t}\sqrt{pf}\, H_o^{3/2} \text{ (watts cu/in.)}.$$

P_v = power density in watts/cu in.
p = resistivity of work in microhms-cms.
f = frequency in cycles/sec.
H_o = peak magnetizing force (oersteds).
t = thickness of slab inches.

5. Depth of Current Penetration in a Non-Magnetic Conductor

$$\delta = 1.98\sqrt{\frac{p}{f}} \text{ (in.)}.$$

δ = depth of current penetration.
p = resistivity of work microhms-cms.
f = frequency in cycles/sec.

6. Depth of Current Penetration in Magnetic Conductor

$$\delta = 1.98\sqrt{\frac{H_o p}{Bf}} \text{ (in.)}.$$

δ = depth of current penetration.
H_o = peak magnetizing force (oersteds).
p = resistivity of material in microhms-cms.
f = frequency in cycles/sec.
B = flux density in material—gauss (usually assumed as 16,000).

7. Coil Voltage and Current

$E = H_o\,(2.86 \times 10^{-7}\ NAFK_2)$ volts (rms).

$I = H_o\,(1.43\ \frac{l}{N})$ amperes (rms).

E = coil voltage in volts (rms).
I = coil currents in amps (rms).
H_o = peak magnetizing force (oersteds).
N = number of turns in coil.
A = cross section area in coil (sq in.).
l = length of coil in inches.
K_2 = coil voltage factor
F = frequency in cycles/sec.

8. Coil Inductance

$$L = \frac{r^2 n^2}{9r + 101} \text{ microhenries}.$$

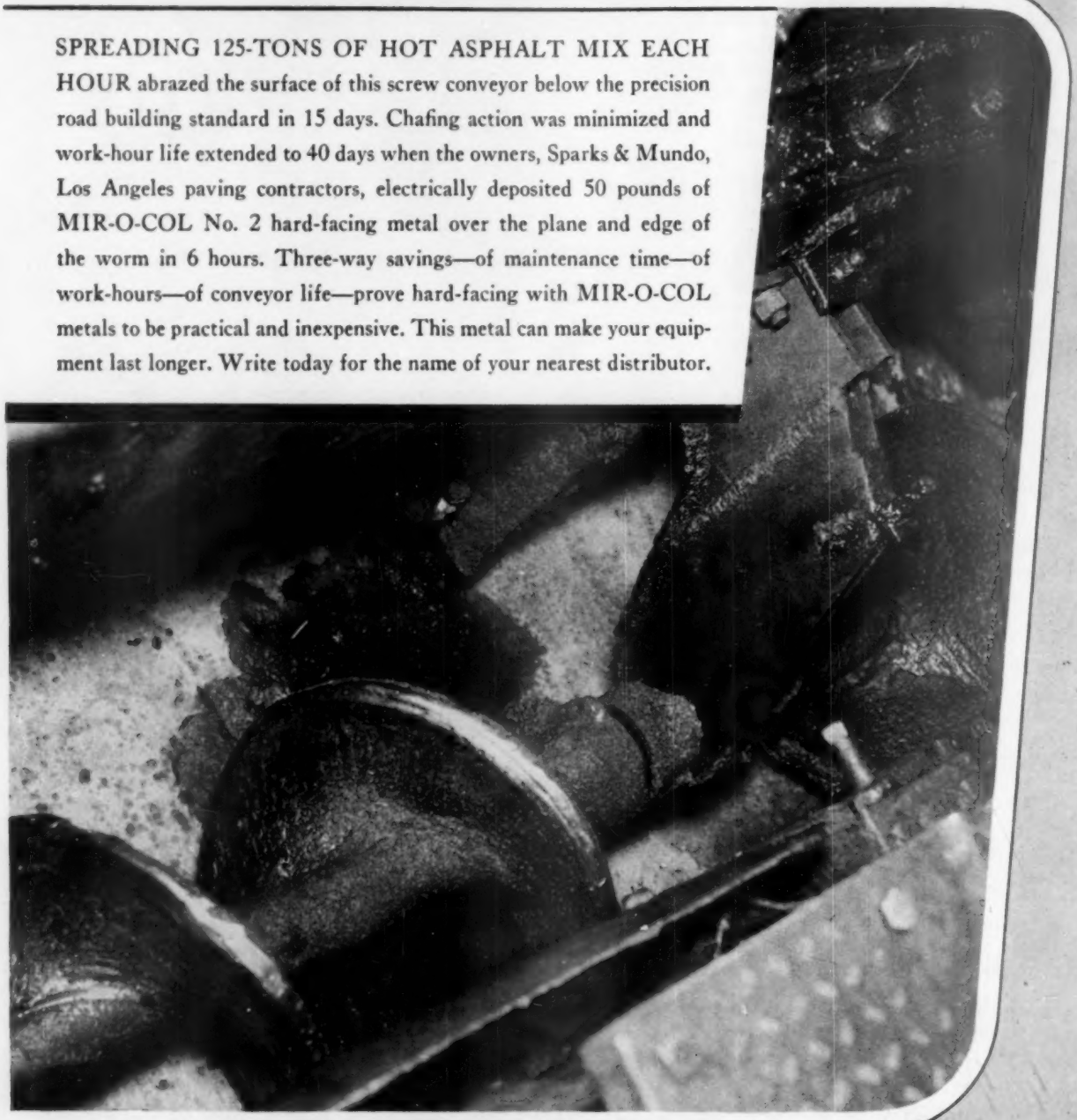
r = mean radius of coil.
n = number of turns.
l = length.

† Formula applicable only if depth of penetration (δ) is less than ½ thickness (t) of slab or less than the wall thickness (t) of a cylinder and if the wall thickness is less than 1/10 of the diameter of the cylinder.

* Data compiled by the Industrial Electronics Division, Westinghouse Electric Corp., Baltimore.

Hard-Faced FOR A TOUGH JOB

SPREADING 125-TONS OF HOT ASPHALT MIX EACH HOUR abrazed the surface of this screw conveyor below the precision road building standard in 15 days. Chafing action was minimized and work-hour life extended to 40 days when the owners, Sparks & Mundo, Los Angeles paving contractors, electrically deposited 50 pounds of MIR-O-COL No. 2 hard-facing metal over the plane and edge of the worm in 6 hours. Three-way savings—of maintenance time—of work-hours—of conveyor life—prove hard-facing with MIR-O-COL metals to be practical and inexpensive. This metal can make your equipment last longer. Write today for the name of your nearest distributor.



Manufactured by

MIR-O-COL

HARD-FACING RODS

ALLOY COMPANY

2416-60 EAST 53RD STREET, LOS ANGELES 11, CALIFORNIA

TO SECURE YOUR FREE COPY of the "Weldor's Guide to Successful Hard-Facing," write to MIR-O-COL ALLOY Company. Give your home address if you wish to be put on the MIR-O-COL News monthly mailing list.

FREE

The Technical Slant

Books are the ever-burning lamps of accumulated wisdom—*K. W. Curtis.*

PRACTICAL DESIGN FOR ARC WELDING, *Volume 3. By Robert E. Kinkead. Published by Hobart Bros. Co., Troy, Ohio, 1945. Cloth, 8½ x 11 in., 200 pages. Price $3.50.*

In the third and final volume of the Hobart welding design series, Mr. Kinkead supplements the "idea stimulators" presented in the first two volumes with the development of three different lines of thought that will be of particular interest to the welding designer and fabricator.

Of the 100 plates included in this volume, 20 deal with the design of heavy construction and earth-moving equipment, 20 with the application of hard-facing from a field and shop maintenance angle, and 20 show in graphic form what not to do in designing for arc welding. These latter plates are particularly valuable to the designer as they show his most common faults in design and suggest how they may be avoided.

The next twenty plates suggest the natural origin of many complex, modern design principles. These pages might appropriately bear the title, "Romance of Design," and if you take your designing seriously, you'll enjoy them thoroughly. The final twenty plates show typical patents that have been granted in connection with the welding process, suggesting to the designer and fabricator of welded parts that he, too, may be able to originate new methods that can be protected by patents.

This volume and its two predecessors present a fairly complete picture of arc-welding design problems and their solution. All three books should be of extreme value to the engineer or architect interested in arc-welded design.

» «

THE PIPE FITTER'S AND PIPE WELDOR'S HANDBOOK. *By Thomas W. Frankland. Published by Bruce Publishing Co., Milwaukee 1, Wisc., 1945. Simulated leather, 5¼ x 3¾ in., 152 pages. Price $1.25.*

This small, "shirt-pocket size" volume contains considerable valuable data relative to piping and piping installations. Through many years experience as a pipe fitter and teacher of apprentice pipe fitters, the author has been able to compile all of the basic information the pipe fitter will need to solve the most difficult problems he encounters in his work.

After opening the volume with a review of mathematics from simple arithmetic to trigonometry, the author takes the reader into pipe fitting calculations and finally into pipe-welding layout. Approximately one-third of the book is devoted to a discussion of the various types of fittings for welded piping—turns, tees, laterals, "y's," reducers, plugs, etc. Sufficient details and data are given in each instance to enable the reader to prepare the joint for welding. The book closes with 40 pages of reference tables designed to meet the specific needs of the pipe fitter or pipe weldor.

» «

ARC WELDING ENGINEERING AND PRODUCTION CONTROL. *By Walter J. Brooking. Published by McGraw Hill Book Company, New York, 1944. Cloth, 5½ x 8¼ in., 347 pages. Price $4.*

An author well known to the readers of THE WELDING ENGINEER has prepared a text dealing with the control of arc welding in production. In a compact volume of 18 chapters Walter Brooking fulfills a pressing need for information to meet the demands for production knowledge in the welding field.

The author carefully points out the importance of welding as a production method and lists the various problems and factors that are ever present in production control. Having thoroughly schooled his reader in the economic benefits of material and engineering control, he progresses to actual shop problems found in production welding. Such topics as flame-cutting, jigs and fixtures, inspection, machining, cleaning prior to painting, etc. are discussed in considerable detail—as is the relation of all these items to an arc-welded product.

Readers not already engaged in production welding will welcome the section dealing with weldor training. Mr. Brooking also points out ways in which welding may be used to produce production aids that will materially assist the speed-up of production in other shop departments. Also of considerable interest are the data presented on the relative merits of a-c and d-c welding and the savings made possible by intelligent electrode comparison tests.

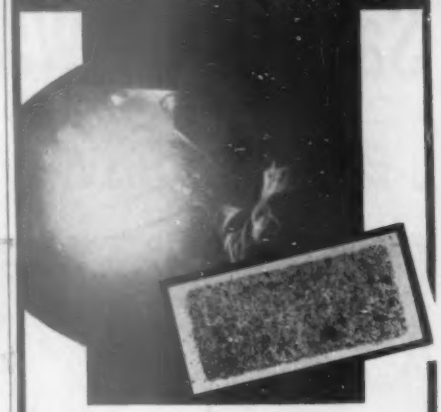
All in all, Mr. Brooking's book is a must for every production man who has anything to do with welding. Here is presented the technical "know-how" needed to analyze any arc welding problem on the basis of its fundamental economies, shop aspects, production factors and means of controls. The book will hold the interest of the production engineer, and it can also be readily understood by the ambitious weldor helper.

Add This Information to Data Sheet No. 58

To make the "Chrome-Nickel and Straight Chromium Stainless Steel Electrode Comparison Chart" appearing on page 71 of the July issue more complete, will you kindly add the following information? This is No. 58 in your file of Engineering Data Sheets.

Reid-Avery (trade name Racolloy): types No. 302, 304, 308—18/8; 309, 309 + Cb—25/12, 25/12 Cb; 310—25/20; 316—18/12 (2-3 Mo); 317—18/12 (3-4 Mo); 347—18/8 Cb; and Mn Modified 307—19/9.

Clear Vision
THROUGH
THERMACOTE COVER LENSES
INCREASES
WELDING FOOTAGE



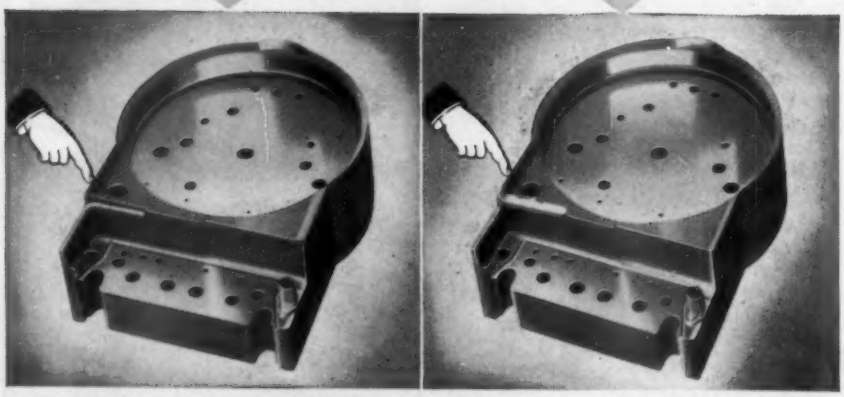
The un-retouched picture above was photographed through an uncoated cover glass on which is one hour's accumulation of weld spatter under average conditions.

This picture was photographed through a THERMACOTE plastic-coated cover lens that had been used, under identical conditions, for THREE WEEKS.

When welding with non-coated or lacquered cover glasses visibility decreases and eye-strain increases as weld spatter accumulates on the glass. Increased welding footage is the logical result of constantly clear vision through the use of THERMACOTE COVER LENSES.

THERMACOTE CO.
NEWARK CHICAGO
LOS ANGELES PORTLAND

Eureka Tool Steel Welding Saves Pre-War Dies . . .



Design of costly mold die changed by welding with Eureka Tool Steel Welding Electrodes

Quick Die Changes Speed Reconversion

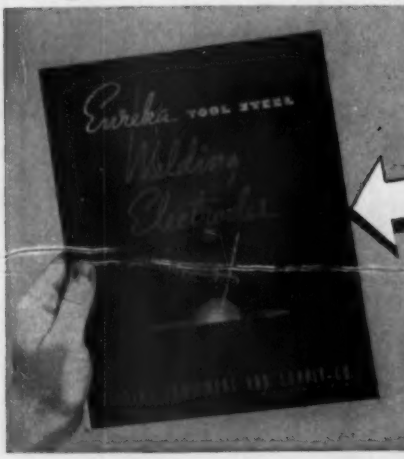
In order to meet the huge civilian demand as quickly as possible, most manufacturers are planning on promoting pre-war items . . . using pre-war dies.

Invariably, however, *some* die changes are exceedingly practical and in many cases essential, and these changes can be quickly made by tool steel welding. Dies used for blanking, forming, forging, drawing, embossing, coining, hot and cold trimming, and in fact dies for practically every purpose can be welded with Eureka Tool Steel Welding Electrodes. *It is not necessary to make new dies* . . . Write today for the complete story.

Eureka Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN



WRITE FOR YOUR COPY TODAY

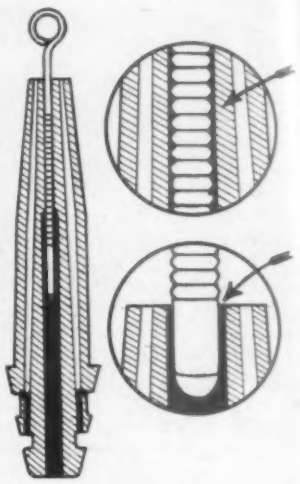
This manual will help you save man-hours, conserve material and minimize production delays by outlining methods of repairing and compositely fabricating tools and dies, as well as correcting design and rectifying errors. Send for your copy today. It is fully illustrated with typical welding applications.

New Products

(Continued from page 72)

Tip Cleaner

★ Better flame-cutting and lower tip replacement costs are claimed to result from use of the new Wypo tip cleaners. This product has a smooth, round pilot



Wypo tip cleaner. These stainless-steel cleaners are made in 21 sizes to cover a range of drill sizes from Nos. 75 to 30.

and an evenly rounded shoulder of stainless steel. It is long wearing and nonrusting and will clean and polish the inside of the tip without cutting, scratching or gouging it, states manufacturer. A handy leather case contains twelve cleaners, fitting any size of preheat or high-pressure oxygen holes in drill sizes of Nos. 75 to 49 inclusive. Nine larger sizes are made individually to fit larger tips, with holes matching drill sizes from Nos. 48 to 30. **Maitlen & Benson**, 1312 Rose Ave., Long Beach 4, Calif.

» «

Elevating Table

★ **Revolvator Co.**, North Bergen, N. J., has brought out the hydraulic elevating table illustrated herewith. Operation is

Revolvator elevating table for raising heavy materials.

by hydraulic mechanism using foot pedals. Running gear consists of two rigid and two swivel roller and ball-bearing castors. A removable push bar is furnished with the table. The standard platform is smooth steel; reversible roller and ball transfer tops are also available.

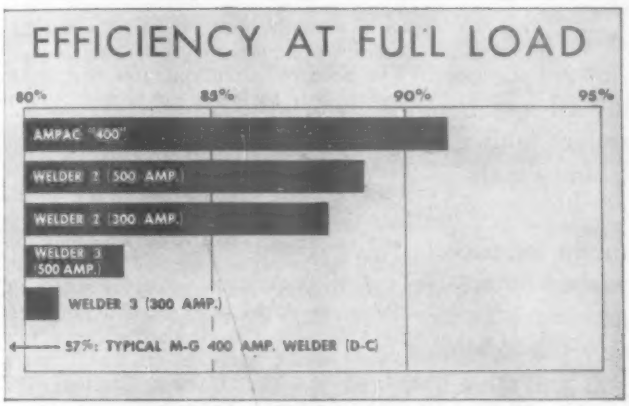
HERE'S THE WAY TO

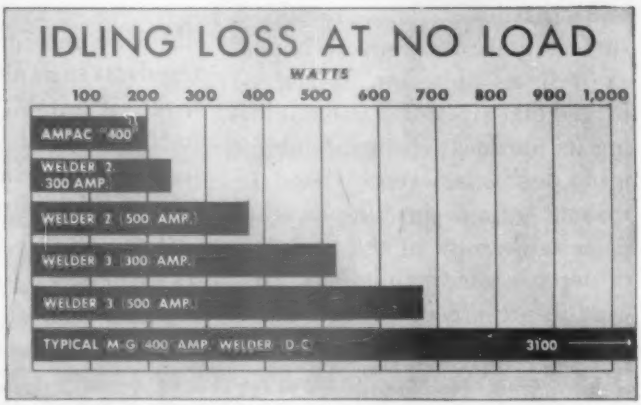
Cut Welding Cost

FOR POSTWAR WELD PRODUCTION

HOW • By replacing your present rotating type d-c machines with economical Ampac a-c welders.

WHY • Because Ampac's lower power consumption contributes toward decreased cost of operation.





YOU GET GREATER EFFICIENCY...

High welder efficiency means *decreased* power consumption — and therefore *lower power bills.* Note in above chart the outstanding rating of Ampac "400" in comparison with the two largest selling a-c welders and a typical d-c unit. Ampac is *tops* in efficiency at full load . . . and at lower currents maintains this efficiency rating. *That's* a record no other welder can challenge! It's long been proven that a-c welding gives you high efficiencies. You get the *highest* with Allis-Chalmers Ampac!

AND LOWER IDLING LOSS...

Idling loss during welding production is unavoidable since the arc is struck periodically. That means current consumed during this idling time is sheer waste. Thus if you *reduce* idling loss you automatically get *greater* welding economy. Note Ampac's low idling loss as illustrated in the above comparison chart. At 2¢ per kw/hr in a full day the d-c unit wastes $1.49. But Ampac's loss is *less than 10¢!* Greater operating efficiency—lower idling loss . . . that's Ampac's *cost-cutting* offer for postwar weld production.

CASE HISTORY PROVES AMPAC'S GREATER ECONOMY

HERE ARE the results of an actual test made between Ampac and a comparable d-c unit.

Machines Compared: a leading 200 ampere d-c motor-generator type welder . . . and an Ampac 200 ampere a-c welder.

Idling Loss Test: d-c unit showed idling rate of 1.63 kw . . . Allis-Chalmers Ampac had idling rate of .09 kw.

KW Input Test: (providing same current output, using same type electrode) : d-c unit averaged 9.3 kw . . . Ampac "200" averaged 5.2 kw.

Thus while furnishing the *same* welding power output, Ampac "200" used only 56% as much current . . . and had but 6% of the d-c unit's idling loss. Think what *that* means in terms of welding economy!

Large-scale welding will play a major part in postwar production. And *cost* will be all-important! For postwar markets will bring *stiff competition.*

Prepare *now* for greater postwar weld economy. Switch to Ampac a-c welders. Get full details from our nearby welder dealer or district office. Or write direct to ALLIS-CHALMERS, MILWAUKEE 1, WIS.

ALLIS-CHALMERS

A 1820

"*Economy Hardface*" Increases Service Life of Ferrous Wearing Parts

The metal for many parts subjected to excessive wear must have certain qualities such as strength or ductility which make it impossible to give the initial hardness or to develop a surface hardness from cold-working that would endow it, additionally, with maximum wear resistance.

In such cases, it is economical to hard-face the wearing surface of the part with a special alloy which will afford adequate wear resistance to supplement its other required properties.

A-475 Dipper teeth hard-surfaced with Economy Hardface for greater service life in hard rock work.

Amsco Economy Hardface makes sound, hard deposits with a Brinell number of 450-550. It is air hardening and provides a surface that resists severe impact as well as abrasion. It can be forged and air-cooled without losing its hardness and can be built up to depths between ½" and 1" without serious checking or other defects. Because of the thickness of deposits obtainable, it is often used in preference to other hard-surfacing rods.

Economy Hardface is ideal for application to such parts as quarry dipper lips and teeth, rock crusher jaws, pulverizer hammers and steel mill equipment where both abrasion and impact are encountered. Its high abrasion resistance makes it suitable for hard-surfacing cams, clutches, rollers, muller tires, sprocket wheels, and a multitude of other parts.

665 The service life of these pug mill knives was doubled by application of a "hardskin" of Economy Hardface welding rod.

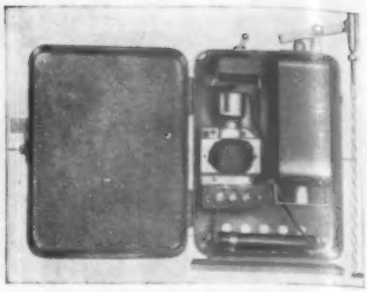
A pug mill operator states: "*The knives as furnished by the machine manufacturer have cobalt-chromium-tungsten welded tips, which wear off in about three days, whereas the knives as we weld them back up to shape with Amsco Economy Hardface rod will wear about six days.*"

Bulletin W-20-A contains suggestions for applying Economy Hardface, while Bulletin 941-W describes all Amsco Conservation Welding Products.

•

(Amsco Welding Products are produced and sold in Canada by Canadian Ramapo Iron Works, Inc., Niagara Falls, Ontario.)

Amsco
AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois
FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES
AMERICAN Brake Shoe COMPANY



Hobart FW-1400 idling device. Basically, it is a mercury time-delay switch that remains closed for 12 to 15 sec after welding stops.

Idling Device

★ For use with gas-engine-driven welders, a new mercury-type idling device automatically shuts down the engine to idling speed in a period of 12 to 15 seconds after the operator has stopped welding. To restore the engine to normal welding speed, it is only necessary to strike an arc.

The device is built around a mercury switch which closes instantaneously but has a 15 second delay in opening. The delay is obtained by causing the mercury to flow through a small orifice on the release stroke. When welding stops, the time-delay switch remains closed for 12 to 15 seconds, then opens up and allows current to flow through the solenoid coil. The solenoid then operates and closes the throttle to idling position.

The switch is totally enclosed in a stainless-steel case and sealed under a pressure of hydrogen gas. The sealed construction renders the relay impervious to atmospheric dirt and moisture. The device is installed by connecting its chain to the carburetor and adjusting the chain to close the butterfly at the top of the stroke of the solenoid. The governor-to-carburetor rod is also replaced with a rod of the same length containing a slip joint. **The Hobart Brothers Co.**, Hobart Square, Troy 1, O.

» «

All-Position Electrode

★ The Champion "Blue-Dac" is a new AWS E-6011 electrode suitable for welding in all positions with either a-c or d-c reverse polarity. It is said to be one of the first electrodes on the market to be tested and approved by the American Bureau of Shipping and The Lloyds Register of Shipping under the new specifications A 233-45 T for electrodes. **The Champion Rivet Co.**, 108th & Harvard Ave., Cleveland 5.

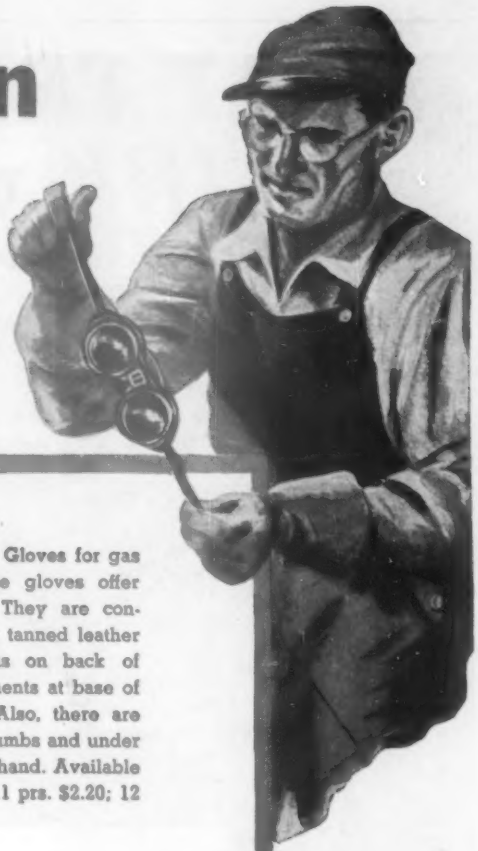
» «

Plastic Salt Tablet Dispenser

★ The M.S.A. molded plastic salt tablet dispenser is made of reinforced Bakelite and is corrosion and moisture-proof. It holds 1,500 ten-grain tablets of either sodium chloride or combination sodium chloride and dextrose, providing one tablet at a time with each fractional turn of the dispensing knob. **Mine Safety Appliances Co.**, Braddock, Thomas and Meade Sts., Pittsburgh 8.

Better Protection for your welders

. . . helps to improve work output and quality — *for You*



Airco Coverspec Goggles These goggles are designed to protect eyeglasses against pitting caused by hot oxide particles. They fit readily over the operator's eyeglasses and the rigid bridge prevents catching on the eyeglasses when the goggles are removed. They are fitted with standard Noviweld or Didymium-Noviweld lenses of 50 mm. diameter. Prices: $2.15 with Noviweld lenses in all shades; $2.75, with Didymium lenses in all shades.

Airco Super-Quality Leather Gloves for gas welding and cutting. These gloves offer superior wearing quality. They are constructed of cowhide chrome tanned leather with seamless palm, seams on back of fingers, and welt reinforcements at base of second and third fingers. Also, there are reinforcement patches on thumbs and under fingers, and on back of left hand. Available in size 11 only. Price: 1 to 11 prs. $2.20; 12 to 49 prs. $1.95.

IT'S a wise policy to give your welding and cutting operators the best possible protection against eye and hand injury. Outfit them with high-quality Airco goggles and gloves and their work will reflect their increased confidence . . . their appreciation that you are vitally concerned with their health and safety.

All Airco goggles are fitted with the best filtering lenses available, yet cost no more than ordinary goggles. Airco gloves are designed to give maximum protection while permitting full freedom of finger movement.

Your nearby Airco storeroom carries a stock of these economical, safety-comfort goggles and gloves — together with a complete line of Airco products.

Save Buying Time

Send for your FREE copy of this illustrated folder — "Welding Supplies Price List" It gives complete details on Airco's comprehensive line of gas welding supplies. Address your nearest office or write to Dept. WE at the New York Office.

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in All Principal Cities

AIRCO

Everything for gas welding and cutting

HEAT TREATING

"The LINK That Joins Your Welding to Good Results"

60 Kva. BH Type Induction Heater with automatic heat recording and controlling equipment

Preheating may be the one missing link in your chain of welding operation that causes you to miss out. Don't neglect this important link to good results.

Your welding job is no better than the heat treatment it receives, both before and after welding.

If you select Low Frequency Induction pre- and post-heating equipment, you assure dependable results and absolute control in this important link.

The Smith-Dolan System provides maximum convenience and efficiency in Induction Heating. It is now meeting successfully the long felt need for a combination shop and field heating unit to bring dependability to the welding of alloy and high carbon steels.

Whether the welding job involves:

High pressure steam lines . . .

or

The propeller shaft of a fighting ship . . .

or

Pre- and post-heating of boiler drums and plates when automatic arc welding is used . . .

. . . or any other important job . . .

THE RESULTS JUSTIFY THE SELECTION OF THIS METHOD

Wherever controlled deep heating penetration is necessary, the Smith-Dolan System is the choice.

Our experience is at your service. Let us show you how pre-heating and normalizing can do a better welding job for you.

ELECTRIC ARC INC.

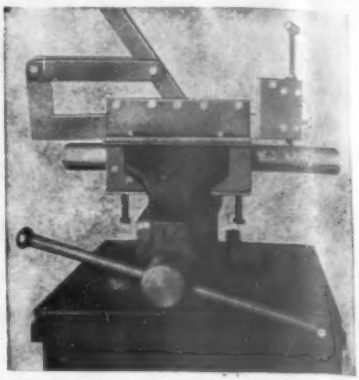
152-162 Jelliff Ave. Newark 8, New Jersey

Also manufacturers of

Arc Welders—Gasoline and Diesel Driven—Power Units—A. C. Welders

Keyway Cutter

★ The "B.W." keyway cutter cuts slots of any width, length and depth in shafts measuring up to 2⅞ in. in diameter. A



Wiese "B.W." keyway cutter in a 75 lb machine vise with a 1½ in. shaft.

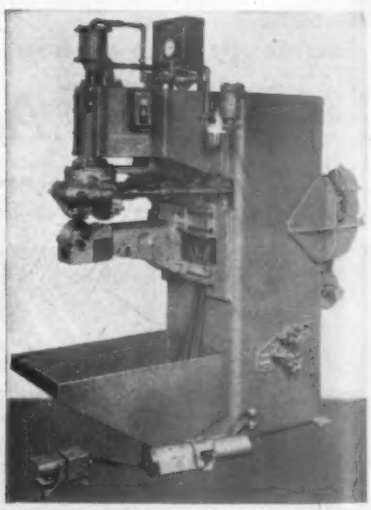
2¼ by ¼ in. keyway can be cut in less than 5 minutes, declares manufacturer. The shaft is self centering, and the cuts may be made in either the middle or on the edges. Bits are made of ⅜ in. square tool steel and sized; the bits furnished are ¼, ⅝ and ⅜ in. and one blank. The **Wiese Co.**, 1507 Fifth St., Perry, Ia.

» «

Light-Duty Seam Welder

★ Thomson Model 6 is offered for the seam welding of mild-steel sheets in two thicknesses ranging from 30 to 18 gauge. Production speeds are said to range up to 20 ft per min. This seam welder may be employed for circumferential or for longitudinal welds or as a universal machine for rapid conversion from one to the other. The picture shows the swiveling upper head and interchangeable lower arm which enable conversion.

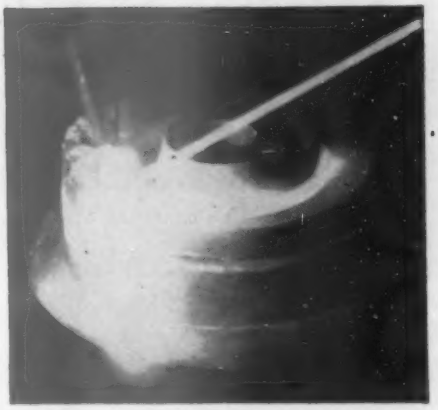
This machine is available in various throat depths and transformer capacities to suit the work. The welding wheels may be gear or knurl driven, and the drive may be applied to upper, lower or both wheels. **Thomson-Gibb Electric Welding Co.**, Lynn, Mass.



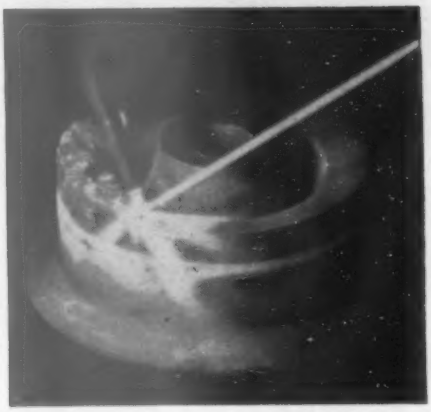
Thomson Model 6 seam welder for light-gauge steel sheets. It may be rapidly converted from circumferential to longitudinal seams.

It pays to use

AO Noviweld Didymium Lenses



because when your welder sees flare



instead of rod and molten area

you'll see added cost figures

With a *clearer* picture of his work, the welder can lay *cleaner* beads. As a result, secondary operations—chipping, grinding and wire brushing—cost less in time and money.

Noviweld-Didymium Lenses enable the welder to look right through cloudy yellow sodium flare and see the rod and molten area clearly—with full protection against the dangerous hazards of ultra-violet and infra-red rays.

Right now, you can get immediate delivery of Noviweld-Didymium Lenses for the welding goggles of *all* of your operators in shade numbers 4, 5 and 6. Phone, wire or write to your nearest American Optical Branch Office today.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

News of the Industry

Develop War Standards to Protect X-Ray Users

A wartime safety code for the industrial use of X-rays, recently completed by a War Committee of the American Standards Association, will also form the basis for a permanent peacetime standard. The code was drawn up by a committee of the nation's leading experts on industrial radiography, with George Singer, National Bureau of Standards, as chairman. Much of the material it contains grew out of research undertaken since November, 1944—the month in which the committee started work on this job of protecting industrial X-ray users.

Previous standards developed by the National Bureau of Standards and embodied in the handbook "X-ray Protection" (1931 and 1936) were intended particularly for the medical field.

» «

Mobile Oxygen Plants Used by Armed Forces

One of our wartime secrets only lately revealed is the "on-the-spot" production of oxygen for the crews of planes flying at high altitudes, for medical purposes and for welding and cutting operations conducted by maintenance units near the front lines.

Original practice was to use the standard oxygen cylinders employed in ordinary civilian uses. This meant the transportation of heavy steel cylinders from the point of manufacture to the point of use and the later return of the empty cylinders for refilling. To avoid all of this hauling and assure a reliable nearby source of oxygen, there was developed the mobile generator used by the Armed Forces at advance bases.

A factor in the successful performance of this unit was the use of glass textile fibers, installed in thicknesses of from 6 to 12 in. for insulation. The fiber glass has a low conductivity at the extremely low temperature (—300 F) involved in the production of oxygen. Convection currents tending to work against the proper operation of the plants are also decreased by the glass fiber insulation.

The mobile oxygen generating plants were manufactured by Air Products, Inc., Chattanooga. Insulation material was supplied by Owens-Corning Fiberglas Corp., Toledo.

» «

Ergolyte Launches Sales Campaign to Back Jobbers

An advertising and sales promotion program has been developed by the Ergolyte Mfg. Co., Philadelphia, to back its jobbers and their salesmen. Forty-four per cent of the total appropriation will go directly for jobber helps such as jobber data sheets, sales manuals, mailing pieces, sales bulletins, etc.

» «

Square D Completes New Canadian Plant

Square D Company Canada Ltd., an affiliate of the Square D Co., Detroit and Milwaukee, will shortly be located in its newly constructed Toronto plant. Total floor space of the new plant is approximately 60% greater than in the plant and office being vacated, and room for still more expansion is provided at the new location.

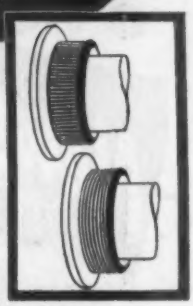
Always
PICK THE RIGHT ROD
...to do the job RIGHT
130 RED-ROD
110 HYCARB-ROD
61 BRONZ-ROD
250 MANG-ROD
40 BLU-ROD
151 ALL-POSITION
80 ALUMINUM-ROD
308 STAIN-ROD
44 NICOL-ROD
450 HARD-ROD
650 TOOL-ROD
42 CAST-ROD
It's Easy with a
MARQUETTE
REGISTERED U.S. PAT. OFFICE
WELD·ALL
ELECTRODE KIT
A broken cast iron gear . . . check the handy chart on the cover flap. The Marquette Nicol-Rod No. 44 is the right rod for this machineable job. The arrow points to a generous supply of Nicol-Rod No. 44. Save time and trouble by doing the job right the first time and build your reputation on dependable welding. No matter what the job, it's as simple as A.B.C. when you have a Marquette Weld-All Kit in your shop. It actually puts at your fingertips the experience and research of Marquette's outstanding staff of metallurgists who designed this kit to take every type of welding job in stride. 12 types of rod in various sizes, each one a leader in its field. The Marquette Weld-All Kit will help you make Extra Profits. 700 Marquette Distributors are ready to serve you.
Marquette Weld-All ELECTRODE KIT
"The Key to Better Welding"
Marquette Mfg. Co., Inc.
Minneapolis 14, Minnesota
MARQUETTE
REGISTERED U.S. PAT. OFFICE
Welding
EQUIPMENT
ELECTRODES And SUPPLIES

THE Hard-Facing ANALYZER

THIS MONTH'S WEAR PROBLEM: TRACTOR ROLLERS

SELECTING the proper hardfacing alloy for any job must always be based upon operating conditions, which vary infinitely between applications. Tractor Rollers, for example, must withstand:

IMPACT of rails against rollers.
ABRASION of earth between metal parts.



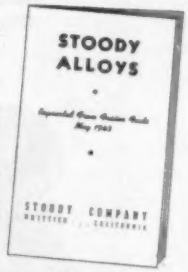
STOODY SELF-HARDENING is the pick of the 12 Stoody alloys for hardfacing tractor rollers. It's tough enough to take the jarring impact of heavy rails on the rollers without chipping or spalling, and the high-alloy content provides the extra wear resistance to combat earth abrasion. Wear resistance is so great, in fact, tractor rollers hard-faced with Stoody Self-Hardening outwear by two to one the best high carbon that can be applied! Because of Stoody Self-Hardening's low coefficient of friction, actually less wear occurs between roller and rails than with steel-to-steel contact.

In addition, Stoody Self-Hardening is easy and fast to apply, is very dense and can be readily peened to shape. An expert welder can apply this alloy so smoothly that grinding after hardfacing is unnecessary.

HARD-FACING PROCEDURE:

Stoody Self-Hardening can be applied to tractor rollers either of two ways: (1) A bead run around the outer edge and space between the bead and collar filled in with horizontal welds or (2) A bead around the outer edge to bring the roller back to diameter, and intervening area between outer edge and collar filled with a series of circumferential beads of hard metal. Either method is equally successful but the latter has the advantage of more easily maintaining roller concentricity. Rollers with integral bearing assemblies are best hardfaced immersed in a tank with circulating water to keep bearings cool.

To resist all types of metal wear under any set of conditions, Stoody alloys are made in a dozen different analyses. Each hard-facing rod has its own definite characteristics and is recommended for specific applications. OUR FOLDER "Stoody Alloys" explains the sizes, styles and properties of each rod and lists several hundred tested applications in 17 industries. A copy is yours for the asking. Write today.



STOODY COMPANY
1141 SLAUSON AVENUE, WHITTIER, CALIFORNIA

STOODY HARD-FACING ALLOYS
Retard wear . . . Save Repair

New Welding Processes Used on Aluminum Pontoon Bridges

Welding's newest processes—atomic-hydrogen arc welding and machine welding by the inert-gas-shielded method—received the approval of the Army Engineer Board for use in the construction of the Army's lightweight aluminum pontoon bridge.

This bridge consists of a series of balks (hollow square beams) which are locked together with pins to form a flooring resting on the pontoon boats. The balks are of aluminum alloy and are so light that they can be placed by hand yet strong enough to bear a load of 50 tons. The fabrication of each beam involves two longitudinal seam welds to make a box section from two extruded channels.

The original specifications called for automatic carbon-arc welding of the longitudinal seams. General Electric engineers, however, believed that the job could be better done by the newer methods. They submitted samples made at the Detroit plant of the Copco Steel and Engineering Co., and as a result the Engineer Board gave its approval for the use of the atomic-hydrogen and the inert-gas-shielded processes. The last-named process was also approved for the manual closure welds made on the ends of the balks.

Whiting Corp. Helps Make Atomic Bomb

One of the firms contributing to the research and production that have led to the atomic bomb is Whiting Corp., Harvey, Ill., a concern well known in the welding industry. Because of Whiting's long record of successful achievement in the design and manufacture of special industrial equipment, the engineering firms entrusted with the task of providing methods and facilities for the bomb project, assigned to Whiting certain phases of the work. Whiting's principal contribution consisted of special equipment essential to the manufacture of the bomb.

Accustomed to handling contracts of high military priority, Whiting completed its portion of the work with the complete secrecy that has made this the best kept secret of the war.

New Distributorships

Ampco Metal, Inc., Milwaukee: The C. W. Krieg Co., 52-60 Dickerson St., Newark 4.

» «

Mir-O-Col Alloy Co., Los Angeles: Anderson Equipment Co., 644 E. Florence Ave., Los Angeles 1; Evansville Auto Parts, 205 N. W. Riverside Dr., Evansville 8, Ind.; Kilmer & Sons, Inc., 1001 W. First Ave., Spokane, Wash.; Nogales Welding & Machine Co., 468 Grand Ave., Nogales, Ariz.; Weldit Acetylene Co., 638 Bagley Ave., Detroit 26.

» «

Tweco Products Co., Wichita, Kansas: Henry R. Jahn & Son Co., 7 Water St., New York City 4, for the sale of the complete Tweco line in world markets with the exception of the United States, Alaska, the Hawaiian Islands and Canada.

For a Good Job

The achievements of our Armed Forces on land, sea and air have brought total Victory to us months—if not years—earlier than anyone had dared to hope. To the wearers of the Honorable Discharge Button—THE WELDING ENGINEER salutes you for a good job well done!

Remember this emblem. It stands for honorable service to our country.

BOTH OF THESE TOOLS ... are compact, light weight (up to 3 lbs. lighter than other tools of similar capacity) ... amply powered for fast cutting of hot rolled steel up to recommended capacity, softer materials in proportion ... cool running, comfortable to the hand ... elimination of customary handle gives operator complete control of tool in all positions. Ask your distributor today for a demonstration.

SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill. • Factory Branches in All Principal Cities

PLANNING RETOOLING AFTER-THE-WAR?

Let SKILTOOL Field Engineers help you now to plan "tooling-up" for more efficient and economical peacetime production with SKILSAW'S new postwar tools.

Rutile gains valuable new properties through research:

Ruflux

TAMCO is...and has been for a number of years... the largest supplier of titanium compounds used in welding rod formulation, such as rutile, potassium and sodium titanate. Also, we furnish alloys such as 40% low carbon ferro titanium, nickel and manganese titanium for special coating formulation and compounds such as zircon, potassium zirconate, etc. Manufacturing operations covering these compounds are carefully controlled, and uniform products are assured at all times.

RUFLUX P A potassium titanate containing approximately 73% TiO_2 and 19% K_2O. This compound is used for arc stabilization purposes and contains no injurious impurities. Ruflux P is milled to approximately 4% on a 200 mesh screen.

---

1. Ruflux 61—A 93% to 95% TiO_2 containing rutile milled to from 0.5% to 1½% on a 200 mesh screen. Major impurities are SiO_2, $ZrSiO_4$, Fe_2O_3 and FeO. Injurious impurities such as S. and P_2O_5 are kept to a minimum.

2. Ruflux 84—A 93% to 95% TiO_2 containing granular rutile of similar analysis to Ruflux 61. This coarser rutile is used to avoid coating dry cracking.

3. Ruflux S—A sodium titanate containing approximately 80% TiO_2 and 15% Na_2O. Another arc stabilizer and formulated to reduce hycroscopic action to a minimum.

4. Ruflux Z—A zirconium silicate containing approximately 65% ZrO_2 and 34% SiO_2 combined as $ZrSiO_4$. The compound is milled to 0.10% on a 325 mesh screen and due to its high melting point (3850 F°.) is used as a slag stiffener.

5. Ruflux P. Z.—A potassium zirconate containing 80% to 81% ZrO_2, 14% to 15% K_2O, 3% to 4% SiO_2 and smaller percentages of TiO_2, Fe_2O_3, CaO, etc.

6. Ruflux T—A zirconium oxide containing from 90% to 91% ZrO_2, 5.00% SiO_2, 0.80% Na_2O and lesser percentages of TiO_2, CaO, Al_2O_3, etc. Ruflux T is milled to 0.1% on a 325 mesh screen.

7. 40% Low Carbon Ferro Titanium—containing from 38% to 42% Ti., 3% to 5% Si., 6% to 9% Al., 1% to 2% Cr. The alloy is milled to minus 80 mesh.

8. Tam Nickel Titanium—contains from 25% to 28% Ti., 60% to 65% Ni., 6 to 8% Al., 2% to 4% Si., and 2% to 5% Fe. The alloy is milled to minus 80 mesh.

9. Tam Manganese Titanium—contains from 27% to 29% Ti., 35% to 40% Mn., 20% to 25% Fe., 7% to 9% Al and 2% to 4% Si. The alloy is milled to 80 mesh.

Tamco also manufactures alloys such as Ferro Carbon Titanium, Bortam and boron containing titanium alloys, and various other titanium and zirconium compounds.

We will be glad to produce any other titanium and zirconium compounds of interest to the welding rod industry as soon as the emergency is over.

It pays to include these compounds in your welding rod coating formulation research.

THE MERIT MARK OF METAL
TAM
METALLURGICAL ALLOYS

THE TITANIUM ALLOY MANUFACTURING COMPANY

Executive Offices: 111 Broadway, New York, N. Y. *General Offices and Works:* Niagara Falls, N. Y.

Arctrol

CUTS your welding COSTS

If you hope to survive in post-war competition that lies ahead, your production costs must be pared to a minimum. War production calls for speed. Peace-time production demands low cost. "ARCTROL" gives you both!

Whether you are still engaged in meeting war contract requirements or are planning on reconversion, "ARCTROL" can help you to speed up production . . . and cut costs as well.

"ARCTROL" regulates generator output from full-rated current down to snuffing it out completely . . . merely by moving the foot pedal. Easily installed with all makes of welders.

Ask your Welding Supply Jobber or write for Data Sheets and Prices.
Specify welding equipment you use.

MULLENBACH ELECTRICAL MFG. COMPANY

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the NAME on the REPORT COVER
DOES make a difference.
Especially when it represents the special facilities necessary to test any weld—in field or factory.
FOR COUNSEL WRITE OR CALL
Triplett & Barton
INCORPORATED
KNOWN FOR THE BEST IN TESTING METHODS
BURBANK, CALIFORNIA
SEATTLE, WASHINGTON
WICHITA, KANSAS

Westinghouse Acquires B. F. Sturtevant Co.

Acquisition of the B. F. Sturtevant Co., Boston, pioneer manufacturer of air handling and processing equipment, has been announced by Chairman A. W. Robertson of the Westinghouse Electric Corp. Sturtevant thus becomes a wholly owned Westinghouse subsidiary, operating as the B. F. Sturtevant Co., a division of Westinghouse Electric.

Headquarters for the expanded Westinghouse air-conditioning activities will be at Boston.

» «

Burdett Oxygen Opens Cincinnati Warehouse

A Cincinnati warehouse at 316 West 7th St. has been opened by the Burdett Oxygen Co., Cleveland. This company has also become the sole distributor in the Cincinnati territory for General Electric welding equipment and supplies. In addition, Burdett brings to the territory stocks of welding and cutting outfits, rods, torches, regulators, welding cable, hose, portable cylinder trucks, goggles, helmets and face shields.

» «

Mir-O-Col Appoints Firm to Handle Export Trade

American Steel Export Co., with offices in New York City and Los Angeles, has been appointed to function as the export department of Mir-O-Col Alloy Co., Los Angeles manufacturer of hard-facing products.

ABOUT PEOPLE

J. H. Deppeler, chief engineer of the Metal and Thermit Corp., New York City, has been selected by the American Welding Society to receive the Miller Award for outstanding work contributing to the art of welding. Since he first became associated with Metal and Thermit in 1912 he has taken a leading part in the development of thermit welding, Murex electrodes and other products and processes. He is one of the founders of the American Welding Society and was its first vice-president.

» «

Lieutenant Harvey Picker, USNR, recently returned to inactive status by the Navy, has been elected president of the Picker X-Ray Corp., New York City. He was executive vice-president of this company until May, 1941, when he went on active duty with the Navy.

» «

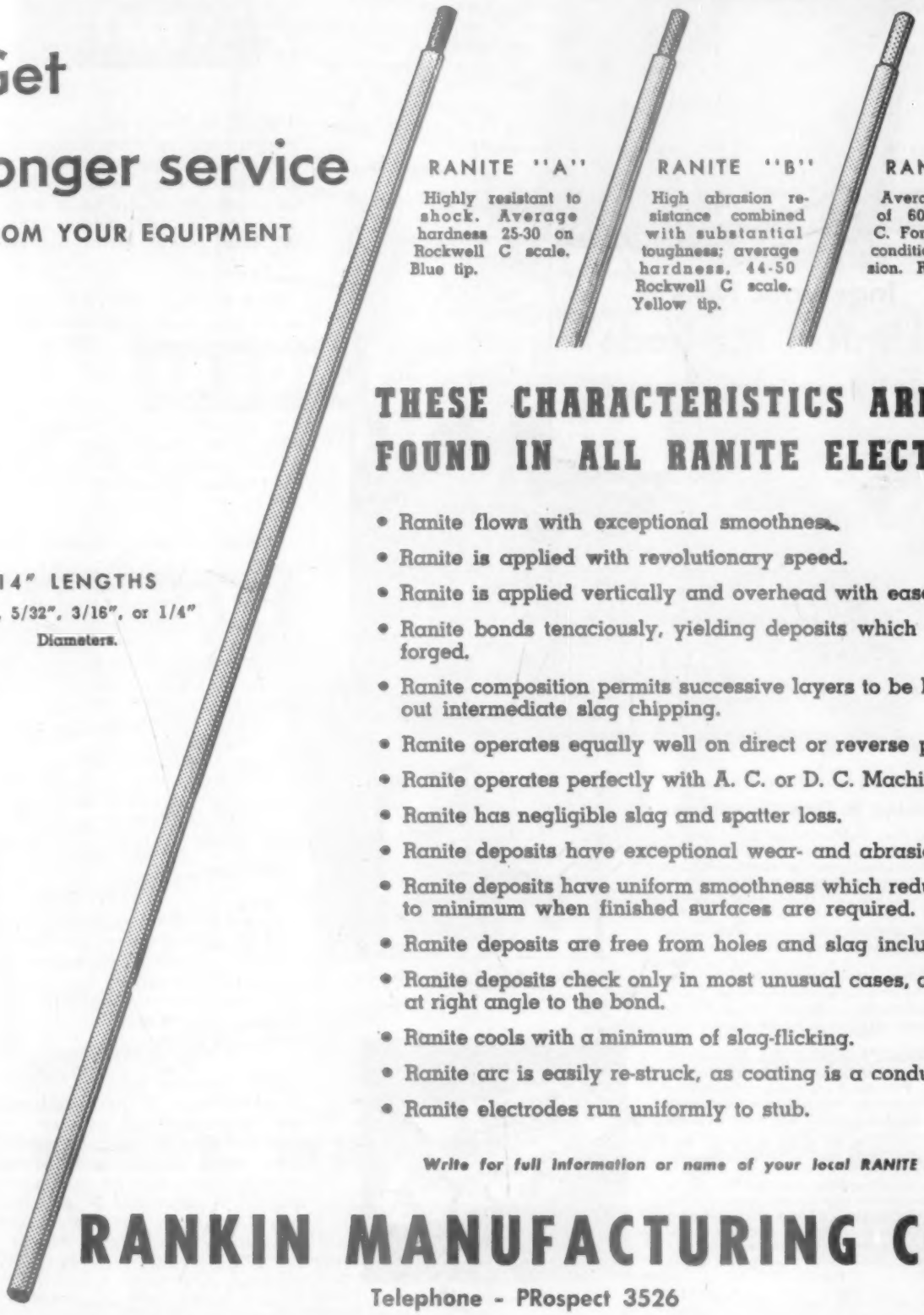
Robert F. Nelson has joined the executive staff of R. G. LeTourneau, Inc., Peoria, Ill., as vice-president and assistant to the president. He was formerly vice-president and director of the Arma Corp., Brooklyn, N. Y.

HARD-SURFACE

with Smooth-flowing RANITE

Get longer service

FROM YOUR EQUIPMENT



RANITE "A"
Highly resistant to shock. Average hardness 25-30 on Rockwell C scale. Blue tip.

RANITE "B"
High abrasion resistance combined with substantial toughness; average hardness, 44-50 Rockwell C scale. Yellow tip.

RANITE "C"
Average hardness of 60-62 Rockwell C. For most severe conditions of abrasion. Red tip.

14" LENGTHS
1/8", 5/32", 3/16", or 1/4" Diameters.

THESE CHARACTERISTICS ARE FOUND IN ALL RANITE ELECTRODES

- Ranite flows with exceptional smoothness.
- Ranite is applied with revolutionary speed.
- Ranite is applied vertically and overhead with ease.
- Ranite bonds tenaciously, yielding deposits which may be hot-forged.
- Ranite composition permits successive layers to be built up without intermediate slag chipping.
- Ranite operates equally well on direct or reverse polarity.
- Ranite operates perfectly with A. C. or D. C. Machines.
- Ranite has negligible slag and spatter loss.
- Ranite deposits have exceptional wear- and abrasion-resistance.
- Ranite deposits have uniform smoothness which reduces grinding to minimum when finished surfaces are required.
- Ranite deposits are free from holes and slag inclusions.
- Ranite deposits check only in most unusual cases, and then only at right angle to the bond.
- Ranite cools with a minimum of slag-flicking.
- Ranite arc is easily re-struck, as coating is a conductor in itself.
- Ranite electrodes run uniformly to stub.

Write for full information or name of your local RANITE Distributor.

RANKIN MANUFACTURING CO.

Telephone - PRospect 3526

1403-05 West Washington Blvd. Los Angeles 7, California

Dr. Wendell F. Hess, professor of metallurgical engineering, Rensselaer Polytechnic Institute, Troy, N. Y., has been awarded the American Iron & Steel Institute medal for 1944 for his paper, "Recent Progress in the Scientific Application of Welding to Steel."

» «

Joseph W. Frazer, chairman of the board of Graham-Paige Motors Corp., has assumed the presidency in a realignment of officers to prepare the company for re-entry into the automobile business. He succeeds **R. J. Hodgson,** president of Graham-Paige since 1942. The board of directors also elected two vice-presidents: **Vern R. Drum,** vice-president and general manager, and **W. A. MacDonald,** vice-president in charge of sales.

» «

Charles H. Saiter has been appointed sales manager of the new heavy machine division of the Cleveland Crane & Engineering Co., Wickliffe, O. He had been sales manager of the company's former heavy crane department.

» «

C. W. Guyatt, formerly chief industrial engineer, American Steel and Wire Co., has been appointed assistant to C. D. King, chairman of operating committees for United States Steel Corp. He will be located in Pittsburgh and will assist Mr. King in the establishment of production standards.

Don Poor, formerly assistant advertising and sales promotion manager of Lyon Metal Products, Inc., Aurora, Ill., has been appointed advertising manager of Ceco Steel Products Corp., Chicago.

» «

Ampco Cleveland and Pittsburgh offices are to be operated as one territory with **Emil Svoboda** as district manager with headquarters at 4500 Euclid Bldg., Cleveland. He will be assisted by **John C. Kemp,** who has been transferred from the Milwaukee home office.

» «

W. B. McKenzie has been made midwestern zone manager of Ampco Metal, Inc., with headquarters at 600 S. Michigan Ave., Chicago. **Jack Bybee** has been transferred from Detroit to Milwaukee, where he becomes district manager. **J. W. Nebel** becomes district field engineer.

» «

Fred H. Opitz will be in charge of a newly organized export sales department of Ampco Metal, Inc., Milwaukee.

» «

Robert V. Lackner has been appointed field engineer for the Pittsburgh district office of the Allis-Chalmers Mfg. Co. He was formerly at the Duquesne works of the Carnegie-Illinois Steel Corp.

» «

Maurice Foote, formerly superintendent of LeTourneau plant No. 1 at Peoria, Ill., has left for England to serve as plant manager of a new branch factory of R. G. LeTourneau, Inc. **Brig. W. E. R. Blood,** in charge of the British Army Engineers' headquarters at Washington, D. C., is managing director designate of the new branch.

» «

Ralph E. Wimmer will be in charge of the new Chicago branch office of Stow Mfg. Co., established at 308 West Washington St. He has represented Stow in the middle west for a number of years.

» «

Robert H. Gardner, formerly assistant sales manager of Caterpillar Tractor Co., has been appointed general manager of sales of A. M. Byers Co., Pittsburgh. He takes over the duties of the late **Myron J. Czarniecki.**

» «

S. C. Lawson, formerly central divisional manager of Ampco Metal, Inc., has been appointed assistant general sales manager in charge of field operations. **Philip F. Erlandson** has been appointed eastern zone manager with headquarters at 1060 Broad St., Newark. **William J. DeMuth** has been transferred from Buffalo to become district manager of the Newark territory, and **W. T. Peterson** has been transferred from Newark to Detroit, where he becomes central zone manager with offices at 4612 Woodward Ave.

Now! Projection Welding of Two Studs to Housing in One Operation!

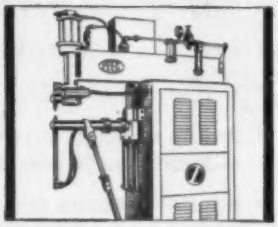
The series of P-20 Peer Welders were developed to provide manufacturers of sheet metal and wire products with automatically air operated machines capable of high speed precision projection and general spot welding. They are sturdily constructed, low priced, direct air operated, press type machines.

Shown above, is a Peer P-20 set up with safety guard which is so adjusted that, when lowered, it trips the switch and causes the welder to pass through a complete welding cycle before the machine automatically lifts the guard and stops, ready for the next operation. Other means such as a footswitch control, can also be used to actuate the welding cycle.

The standard cylinders furnished with these welders provide nominal electrode force up to a maximum of 1000 lbs. Pressures are easily adjusted by the air pressure regulating valve. The welders may be operated with strokes suitable for work at hand within the range of from 0" to 3".

Shown at right, is the wrapper from a package of Wrigley's Spearmint Gum. This famous wrapper will remain empty until conditions permit Wrigley's Spearmint manufacture in quality and quantity for everyone. Wrigley's Spearmint Gum, will, one day, be back as "a help on the job" to workers in industry. Until then, we ask you to remember this wrapper as a guarantee of finest quality and flavor in chewing gum!

You can get complete information from Pier Equipment Mfg. Co., 8 Milton St., Benton Harbor, Mich.



Air Operated Press Type Spot Welder

Remember this wrapper

Z-82

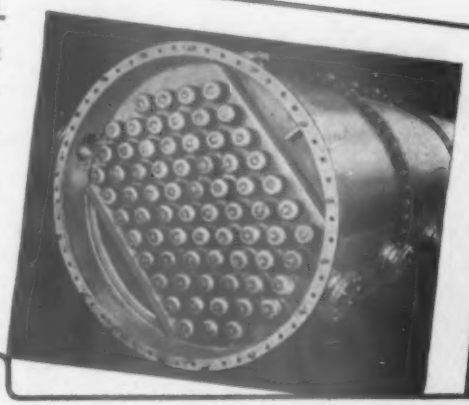
How carbon arc welding with CHASE* OLYMPIC BRONZE

saves

TIME,

Welding

35 ft. copper column welded from top to bottom with Chase Olympic Bronze Welding Rod. Used in the manufacture of penicillin, this huge "bubbling column" is one of the largest all-copper jobs ever welded by carbon arc method.



LABOR,

Welding

Less heat dissipation into the base metal of this distillation condenser meant a saving in man-hours. Fabricated of Naval Brass by the carbon arc method, warpage was held to a minimum. Costs were cut, too, since the work went faster.

MATERIALS

Welding

Low-cost salvage of costly castings has been made possible by the carbon arc method of welding. Chase Olympic Bronze Welding Rod was used here because of density of weld metal resulting, and for closeness of color match.

A special handbook, "CHASE WELDING RODS—and Welding of Brass, Copper, Bronze" outlines the more recent advances in the art of welding copper and copper base alloys by the carbon arc method. Write Dept. WE-9, on your company letterhead, for a complimentary copy.

* Reg. U. S. Pat. Off.

CHASE BRASS & COPPER CO.

—Incorporated—

Waterbury 91, Connecticut

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

ALBANY †
ATLANTA †
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BOSTON
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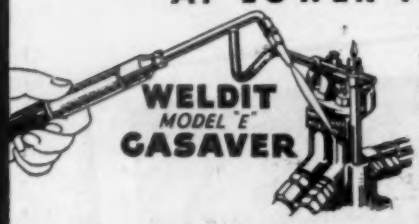
† Indicates Sales Office Only

This is the Chase Network—handiest way to buy brass

Safe Welding

AT LOWER PRODUCTION COSTS



The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as *fifty* per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . *No readjusting required.* . . . Price $10.00 at Detroit. Order today.

Better Soldering, Annealing and Heating Jobs

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

WELDIT ACETYLENE CO.
628 BAGLEY AVENUE · DETROIT 26, MICH.

Now! splice your WELDING CABLE

Easily — Quickly — without Soldering or Rigid Connections

with the

PUNCH-LOK

Streamlined

BANDING METHOD

Punch-Lok Clamp

Loking Tool

Punch-Lok Clamps and Loking Tool will splice that broken cable. You can tie, reinforce, connect, mend and make scores of other applications. Easy, fast, safe, economical. No normal pull strain can tear it loose. Punch-Lok Method will save you time and money.

Write for descriptive catalog and name of nearest distributor.

PUNCH-LOK COMPANY
Dept. E, 321 North Justine Street, Chicago 7, Illinois

KEEP BUYING WAR BONDS

Foster R. Woodward, until recently associated with the Westinghouse Electric Corp. as welding engineer, has joined the staff of the Progressive Welder Co., Detroit, as welding applications engineer. Prior to joining Westinghouse in 1944, Mr. Woodward was for six years with Federal Machine and Welder Co. as welding engineer.

» «

Fred E. Harrell, formerly chief engineer, has been appointed general works manager of the Reliance Electric & Engineering Co., Cleveland. He succeeds **S. B. Taylor,** who resigned as manufacturing vice-president but will remain a member of the board of directors. **William R. Hough,** formerly product development engineer, has been named chief engineer to succeed Mr. Harrell.

» «

Maurice J. Day has been promoted to the position of manager of the alloy bureau, Chicago metallurgical division, Carnegie-Illinois Steel Corp. Mr. Day was formerly alloy contact representative servicing automotive manufacturers. In his new position, he succeeds **Albert L. Kaye,** who has been promoted to metallurgical engineer, alloy steel products, in Pittsburgh.

» «

John Mitchell, formerly alloy metallurgical engineer of the Carnegie-Illinois Steel Corp., leaves this position to become manager of the products section of the alloy sales division.

» «

Lawrence C. Miller, formerly assistant treasurer of the Vanadium Corp. of America, New York City, has been elected treasurer.

» «

Edward Van der Pyl has been appointed superintendent of the Norbide (boron carbide) plant of the Norton Co., Worcester, Mass. He has been with Norton for 30 years, the last few of which he has been specializing in development work on Norbide and diamond products.

» «

J. C. Schaefer, field engineer of the Allis-Chalmers Pittsburgh district office, has been appointed branch office manager at Youngstown, O. He succeeds **E. H. Legler,** who has been transferred to the electrical department at Milwaukee.

Died . . .

Michael J. Sasgen, president of the Grand Specialties Co., Chicago, died July 20 in his home at River Forest. He was 72 years old.

» «

Philip S. Graver, vice president of the Graver Tank and Mfg. Co., East Chicago, Ind., died in Presbyterian Hospital, Chicago, after a heart attack. He was 67 and had been associated with the company for 50 years.

CESCO *Emphasizes* Comfortable Protection for Welders

ITEMS SHOWN

A New exclusive CESCO Air-Flow Helmet (No. 401-60), designed by doctors, proved in plant operation.

B Acetylene Welders Goggle (No. 527), with contoured cups, indirect ventilation.

C Utility Goggle (No. 310-S), for flash protection. With sturdy frame, lightweight.

D Seamless Welding Helmet (No. 401-6), with contour-shaped, easily-adjusted headgear.

E Lift-Front Welding Helmet (No. 401-2), with bakelite lens holder, comfort features of 401-6.

F Gas Welders Shield (No. 433), also for arc welders' helpers.

G Welders Handshield (No. 407), sturdy, lightweight, easy to handle.

DESIGNED WITH A DOUBLE PURPOSE

CESCO safety equipment is designed to provide complete protection and maximum wearing comfort. For example, every device shown on this page incorporates extra features which assure worker safety and help increase production. Besides, CESCO emphasizes top quality in safety equipment—helmets and goggles which stand up under constant use in heavy production. You'll profit by writing for more information *today*.

CHICAGO EYE SHIELD CO.
2330 WARREN BOULEVARD • CHICAGO 12, ILLINOIS

CESCO

CESCO FOR SAFETY

SHOT BLAST quickly wears out the ordinary protective cover liners of sand blast machines. In one Michigan foundry, for example, liner life was only 95 hours. Then Coast Metals Hard-Facing was applied, and now liners average 760 hours! Another foundry that faces liner plates with Coast Metals saves $15.25 every 33 days, and eliminates 10 replacements a month.

No wonder more and more plants are relying on Coast Metals Hard-Facing! Because of its resistance to wear, abrasion, shock and heat, it stretches the life of new or worn parts several times. Application is simple—by arc or acetylene welding. Use it on surfaces, edges, points to keep equipment on the job and save shut-downs.

Write for details in pamplet "Your Best Protection Against Wear."

COAST METALS, INC.
Plant and General Offices:
1232 Camden Ave., S.W. Canton 6, Ohio
Executive Offices:
2 West 45th Street, New York 19, N. Y.

COAST
METALS
hard-facing weld rods
MAKE YOUR
EQUIPMENT
LAST LONGER

Helpful Literature Just Published

The following reviews are of recent publications of interest to those in the welding industry. Unless otherwise stated, they may be obtained without cost by writing to the manufacturers listed.

Stainless Electrode Catalog

The new Alloy Rods catalog (24 pages, letterhead size) is designed to acquaint the reader with the complete "Arcaloy" line of stainless-steel electrodes and their weld-metal characteristics, which differ widely from ordinary carbon steel. The company, it is first explained, has developed three distinct types of electrode coatings: Lime, Titania and AC-DC. Lime-coated electrodes are designed for all-position d-c welding with reverse polarity; Titania coated electrodes for downhand welding; AC-DC-coated for all-position a-c welding. Under each type of eighteen specific electrodes is given such data as physical properties of weld metal, chemical analysis of deposits, welding procedure, uses and applications, qualifications, sizes, identification colors. There are also photomicrographs of weld zones, and three meaty tabulations: (1) electrode analysis and color chart, (2) recommended current ranges for welding, (3) American Iron and Steel Institute type numbers. **Alloy Rods Co.**, York, Pa.

» «

Story of Oxygen

The story of oxygen as used for industrial purposes is told in a new 24-page, two-color Airco booklet, (No. ADG-2014), "Oxygen — Indispensable Servant of Industry." The pictures and text explain how oxygen is produced and why 99.5% pure ogygen can be guaranteed, and describe different types of oxygen "packages" for varying volume requirements, operating conditions and plant gas-distribution methods. In addition there are descriptions of hand and mechanical welding, flame-hardening, flame-cleaning, underwater cutting, hand and machine gas cutting and other flame processes. **Air Reduction Sales Co.**, 60 East 42nd St., New York City 17.

» «

Hard-Facing Catalog

The 16-page, letterhead-size "Dymonhard" catalog covers a group of hard-facing rods and electrodes in the non-ferrous and diamond-substitute groups. A useful feature is a two-page "Comparative Resistance Chart" listing seven types of hard-facing alloys with their uses, available diameters for both arc and gas welding and comparative resistances to abrasion, red heat, impact and shock, chemical corrosion and high heat. The comparative resistances are based on a scale of 1 to 10 (maximum). Another table lists recommended grinding equipment for hard-faced surfaces. **Dymonhard Corp. of America**, 407 Park Square Bldg., Boston 16.

» «

Hard-Facing Booklet

The uses, general compositions, physical properties, sizes, styles, areas covered per lb, prices per lb and tested applications of twelve different hard-facing alloys are covered in a 20-page, 6 by 9 in. booklet, "Stoody Alloys." Published to make it easy for the user to select the proper type of alloy for a particular job, this booklet also includes a useful series of tabulations for various industries, giving the type and diameter of rod recommended and the preferred method of application for each part that is commonly hard-faced. Agriculture, coal mining, construction, brick and clay, railroads, lumber and paper, metal mining, rock products, iron and steel, foundries, power and automotive maintenance are among the industries covered. **Stoody Co.**, Whittier, Calif.

» «

Special Rolled Shapes

An eight-page, letterhead-size folder from Lukenweld pictures various special rolled steel shapes which are normally not available from structural shape mills. Shapes ranging from 10 to 30 ft in length, from 4 to 18 in. in width and from 1 to 5½ in. in thickness can be produced. The company's facilities for flame-cutting, welding, straightening, heat treating and machining are also illustrated. **Lukenweld, Inc.**, 272 Lukens Bldg., Coatesville, Pa.

» «

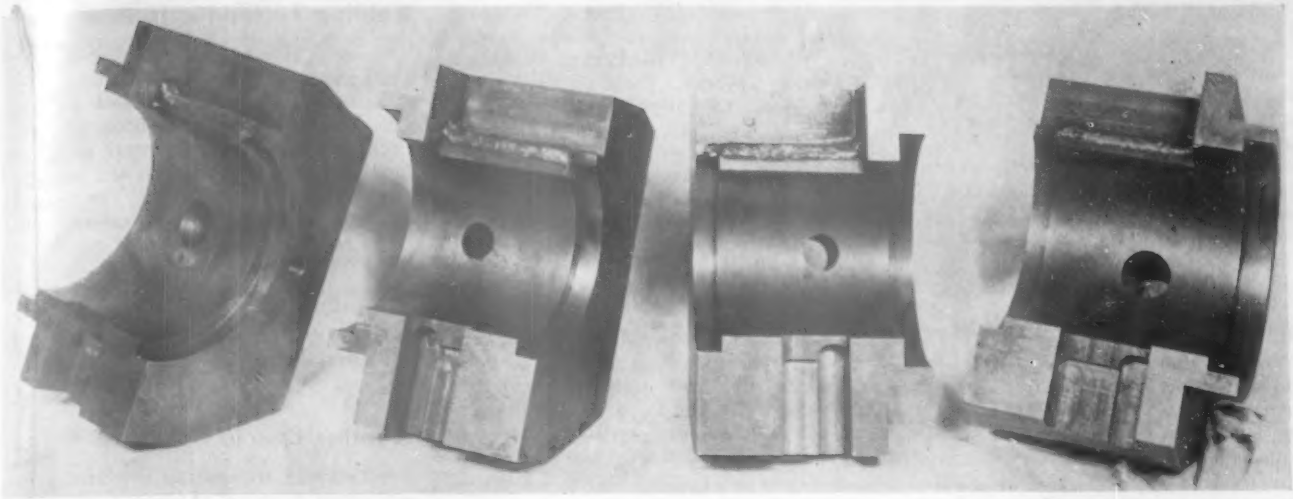
Meco Catalog

Modern Engineering Co., Inc., 3403 Pine Blvd., St. Louis 3, has just announced the publication of the new Meco Catalog No. 120. This is said to be by far the most complete catalog ever issued by this company.

» «

Catalog Insert

A single-sheet, letterhead-size insert, punched for inclusion in the Jessar catalog, covers "Saf-T" curtains for welding plants and protective aprons and sleeves. **Fred Jessar**, 404 Denckla Bldg., Philadelphia 7.



Arc Welding Saved These Cast Iron Dies

THESE cast iron extrusion dies were completely finished only to find that one groove had been incorrectly machined in each piece. A large investment in machining time was headed for the scrap pile, unless the grooves could be filled by welding. Two most important requirements for the weld repair were: (1) The deposit must be fully machinable, even through the line of fusion, and (2) the deposit must show absolutely no sign of porosity after machining. Three beads of ⅛" diameter PHILLIPS "600" Electrode deposited in each groove were enough to bring the parts back to size for proper machining. Each bead was thoroughly wire brushed before making the next deposit. After this simple and easy operation, it was found that all pieces machined perfectly and the deposit was entirely free of porosity.

Cut YOUR losses by welding with PHILLIPS "600" Electrode

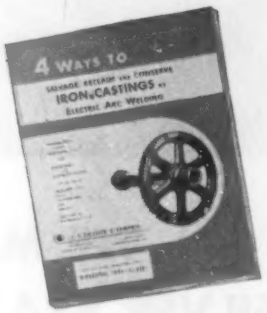
when the drawing room makes a mistake
when the foundry makes a mistake
when the machine shop makes a mistake

Regardless of who makes the mistakes, or what causes the defects, arc welding with PHILLIPS "600" Electrode is a dependable and economical process for repair and salvage of gray iron castings. Many applications are extremely simple, yet they make savings that are impressive, especially when it is a matter of salvaging costly machine work, as well as saving time and materials.

Deposits of PHILLIPS "600" machine perfectly, because the core wire of this electrode contains no iron or other carbide forming elements. The welding causes no distortion of parts, because a minimum of heat is used, and that heat is localized at the point of application. No sign of welding is visible after machining, because deposits of PHILLIPS "600" are of the same color as cast iron.

With all its good points, PHILLIPS "600" is not recommended as a universal electrode for welding cast iron. Use it for: (1) Fully machinable deposits, including the line of fusion, (2) perfect color match with casting, (3) preserving alignment of casting and all machined parts, (4) strong, non-porous deposits. Welding materials and procedures for additional cast iron welding requirements are described in our "4-Ways" manual, which is yours for the asking.

THIS BOOK TELLS HOW



Our "4-Ways" manual is a complete guide to the selection of materials and procedures for arc welding cast iron. Send for your copy TODAY.

C. E. Phillips & Company carry in stock 145 different kinds (not sizes) of welding rods and electrodes. If a rod for your special problem is available, we have it. Catalog and price list on request.

Distributors in all principal cities.

C. E. PHILLIPS & COMPANY

2750 Poplar Street
Detroit 8, Michigan

332 So. Jefferson St.
Chicago 6, Illinois

MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

Positioner Folder

A two-color, four-page, letterhead-size folder describes the "Standard" welding positioner and gives data on its capacity, rotating speeds, table height, table tilting, etc. This positioner is an enclosed, multipurpose machine which provides controlled rotation, elevation and tilting of work weighing up to 700 lb. **Standard Machinery Co.**, Providence 7, Rhode Island.

» «

Spanish Hard-Facing Booklets

To introduce hard-facing procedures and techniques to the Spanish-speaking portion of Latin America, **Mir-O-Col Alloy Co.**, 2416-60 East 53rd St., Los Angeles 11, has brought out two publications: *Guia del Soldador* (Weldor's Guide) and *La Soldadura Perfecta y Superficie Endurecida* (The Perfect Weld and Enduring Surface). These are the Spanish translations of publications previously reviewed in THE WELDING ENGINEER (March, 1945, and August, 1945). Copies are available either from Mir-O-Col or from The American Steel Export Co., Inc., 347 Madison Ave., New York City 17.

» «

Abrasives Information

"Sanding and Finishing with Modern Coated Abrasives" is an 84-page book prepared by **The Carborundum Co.**, Niagara Falls, N. Y., to acquaint users of coated abrasives with a newly announced identification system.

Welding Technique Bulletin

"Ampco-Trode Welding Technique," a 20-page, letterhead-size bulletin, describes the proper methods of welding with coated aluminum-bronze rods. Techniques and procedures are given for metal-arc welding, carbon-arc welding and oxy-acetylene welding. The booklet also includes a heat conversion table showing the melting points, both F and C, of principal metals and alloys. Another feature is a two-page "weldability chart" of copper-base alloys. Ask for Bulletin W-2. **Ampco Metal, Inc.**, 1745 S. Thirty-Eighth St., Milwaukee 4.

» «

Training-Course Brochure

A two-year engineering graduate training course covering production, sales, research, design, field work, administration and other elements of industrial operation is outlined in a recently published brochure, "Where Do We Go from Here?" (16 pages, letterhead-size). The training course involves professional and technical education on the graduate school level, leading to a master's degree. A copy of the brochure, No. E 6085-A, is available on request to Allis-Chalmers Mfg. Co. 569, Milwaukee 1.

» «

Abrasive-Belt Information

A 12-page, letterhead-size booklet, "Faster, Better Finishing Method for Metal, Plastic or Glass," describes the "3-M Wetordry" method of precision abrasive-belt grinding and finishing at high speeds. Advantages of the process as cited by this booklet are: constant speeds, closer tolerances, minimum operating heat, elimination of distortion and plastic flow, increased life of belts, elimination of hazard of silicosis. **Minnesota Mining and Mfg. Co.**, St. Paul 6.

» «

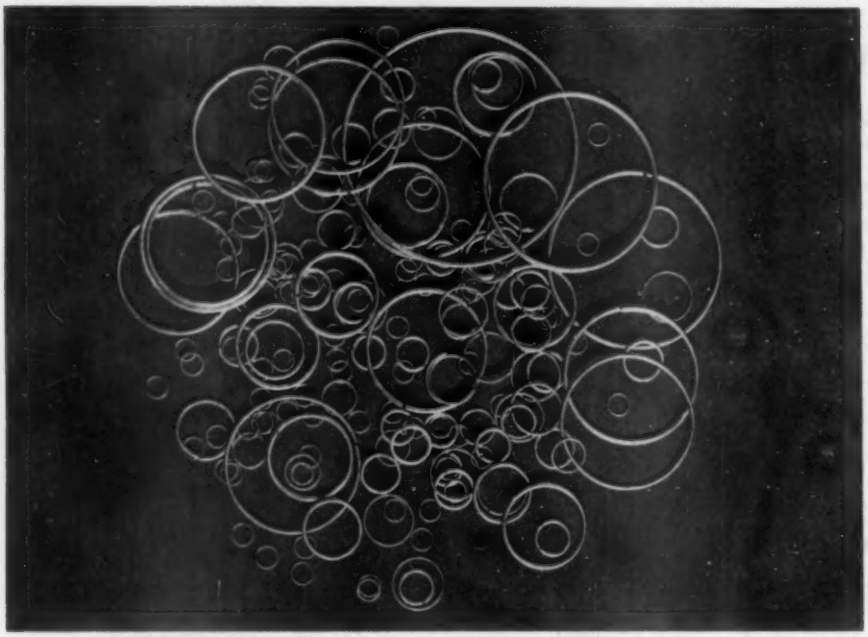
Belt Grinder Folder

An eight-page, letterhead-size booklet, "Plus Factors in Belt Grinding and Finishing with Idler Backstands," presents engineering and production data on the use of coated abrasive belts for grinding and finishing operations. Designed to permit a quick appraisal of the practicability and advisability of a conversion to abrasive-belt grinding in any particular plant, the new folder is well illustrated with production photos, artist's drawings, phantom views, etc. **Behr-Manning**, Troy, N. Y.

» «

Folder on Toggle Clamps

A four-page, letterhead-size folder on "P.E.C." self-adjusting toggle clamps describes a line of clamps designed to hold all kinds of work in jigs and fixtures. The line includes large, medium and small sizes of toggle clamps, toggle clamps with extended bases and quick-action toggle clamps. **Products Engineering Co.**, 9045 Wilshire Blvd., Beverly Hills, Calif.



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Use of our low temperature Easy-Flo Brazing Alloy Rings means fast, reliable low cost brazing. Pre-placed rings speed production, give accurate control of alloy used, assures uniform distribution throughout the joint. We manufacture rings in practically all sizes, also from other types of wire, likewise springs. Easy-Flo also available in standard wire form. Our facilities are complete for assured speedy delivery, and special packaging is available. Discussion of your requirements is invited.

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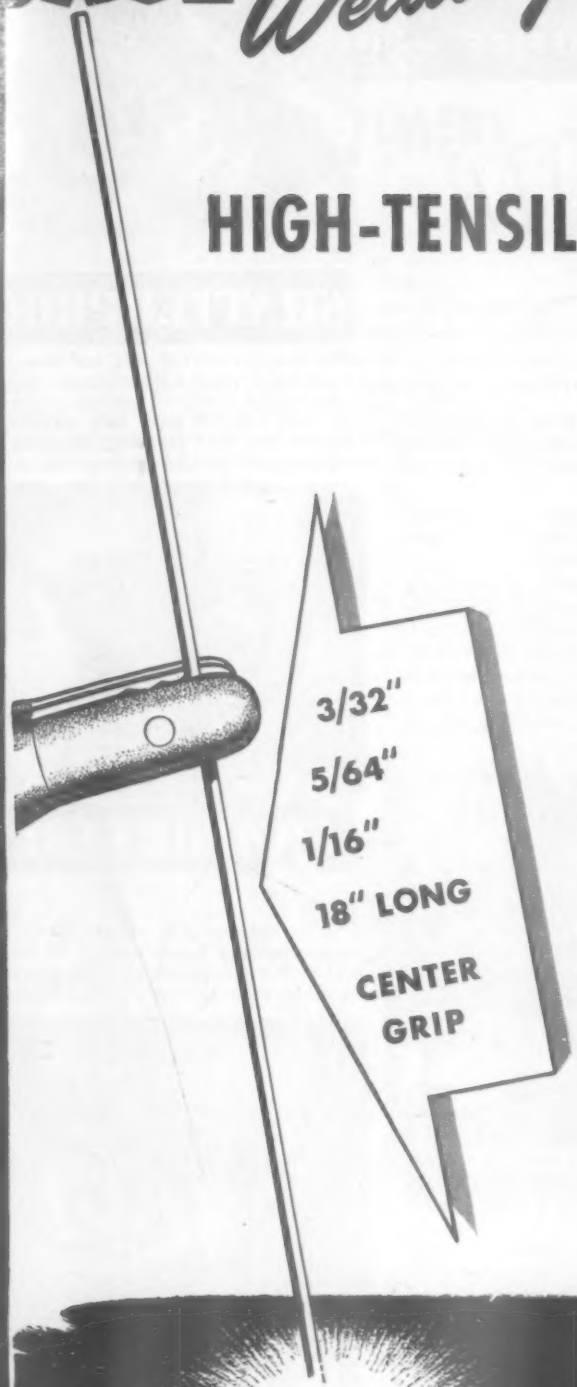
PAGE *Welding* ELECTRODES

HIGH-TENSILE "AF" NOW MADE IN "MIDGET" SIZES



• Light gauges of mild steel, which formerly had to be joined by means of some other method, can now be successfully welded. These new PAGE Hi-Tensile "AF" Electrodes, in midget sizes—3/32″, 5/64″, 1/16″—solve the problem.

These general-purpose electrodes, heretofore made only in sizes down to ⅛″, are of the shielded-arc type—suitable for welding in all positions. They conform to A. W. S. Specifications E 6013, E 7011 and E 7012. These new smaller sizes open up many new possibilities for electric welding.

Your PAGE distributor will give you further information about these and other PAGE electrodes and gas welding rods.

. . . Get in touch with Page

ACCO

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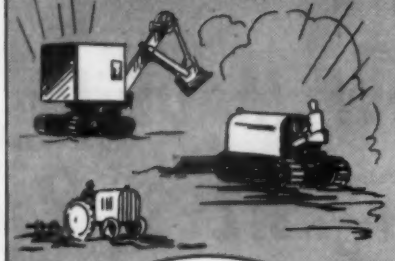
HARD FACING?



THESE
AGILE
ELECTRODES
WILL SOLVE 90% OF YOUR PROBLEMS

DARK GREEN: For economical repair of wearing parts on machinery, plows, excavator buckets, shovel teeth, valves and dies, as well as any other machine part damaged by severe wear and impact.
Brinell Hardness 400-600.

PINK: For hard-surfacing of steel parts in process manufacturing as well as for refacing of worn carbon steel parts, mainly worn or battered rail-ends, tractor shoes and car-wheels.
Brinell Hardness 290-400.

RED: A medium hard and abrasion resistant hard-surfacing material where machineability after welding is required. Usual applications are the rebuilding of gears, knuckles, brakeshoes, clutches, etc.
Brinell Hardness 200-250.

VIOLET: A self-hardening, 12-14% manganese steel weld deposit for the building up of surfaces exposed to extreme impact and abrasion, such as railway frogs, crusher jaws and rolls, pulverizer hammers, etc.
Brinell Hardness 200-490.

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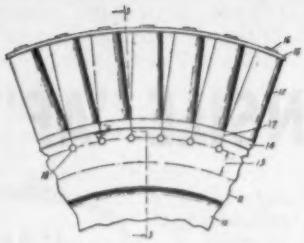


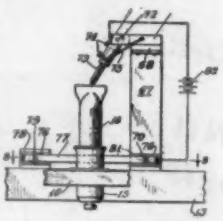
Welded Turbine

2,380,276. **Glenn B. Warren,** Schenectady, N. Y., assigned to **General Electric Co.** Filed Jan. 3, 1944. Issued July 10, 1945.

In an elastic-fluid turbine, a blade-carrying support and a plurality of blade bases having adjacent abutting surfaces. A cast-metal joint is made between the surface of the blade-carrying member and the ends of the blade bases. The cast-metal joint and the blade bases have rounded surfaces forming holes that constitute the terminal portion of the cracks formed by the abutting surfaces of the blade bases at the joints.

» «

Tube-Sealing Method



2,380,054. **Alfred J. Lautmann,** Detroit, assigned to **Iodent Chemical Co.,** Detroit. Filed Aug. 27, 1943. Issued July 10, 1945.

A device for sealing the collapsed end of a filled metallic tube by carbon-arc welding. A shoe, mounted on but insulated from a bracket, is connected to one terminal of the electric circuit and the carbon electrode is connected to the other terminal. The electrode is also mounted on and insulated from the bracket. The tube carrier as it moves into contact with the shoe carries the collapsed end of the tube into contact with the electrode, closing the circuit; the resulting arc melts and interfuses the end of the tube along the line of contact with the electrode.

» «

Automatic Rod Slitter

2,379,907. **Norman Hubbard,** Akron, O., assigned to **The Babcock & Wilcox Co.,** Rockleigh, N. J. Filed Sept. 22, 1943. Issued July 10, 1945.

A slitter for flux-coated electrodes including a cutter, backing-up device and shroud for guiding the coated rods into operative engagement with the cutter. The shroud is disposed on opposite sides of the rod, closely fitting the coating immediately adjacent the zone of the cutting action. It serves to prevent wastage of coating material and provides for clean-cut slot edges.

Outstanding Features of the Willson MonoGoggle

SHATTERPROOF

Workers get overall eye and nose safety with the all-plastic MonoGoggle. One piece lens rigidly anchored but easy to replace. On test resisted steel ball traveling 225 ft. per sec. For grinding, chipping, spot welding and similar eye hazards.

COMFORTABLE

In addition to safety, MonoGoggle wearers get all-day comfort . . . assured by the extremely light weight, rolled contact edges and adjustable head-band. And for protection from glare, the MonoGoggle is now available with the new Tru-Hue Green lens.

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The economical MonoGoggle enables the worker to wear his own prescription glasses and saves management and worker the cost of a special pair.

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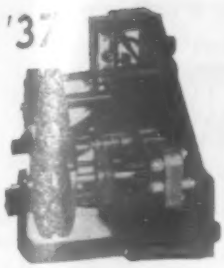
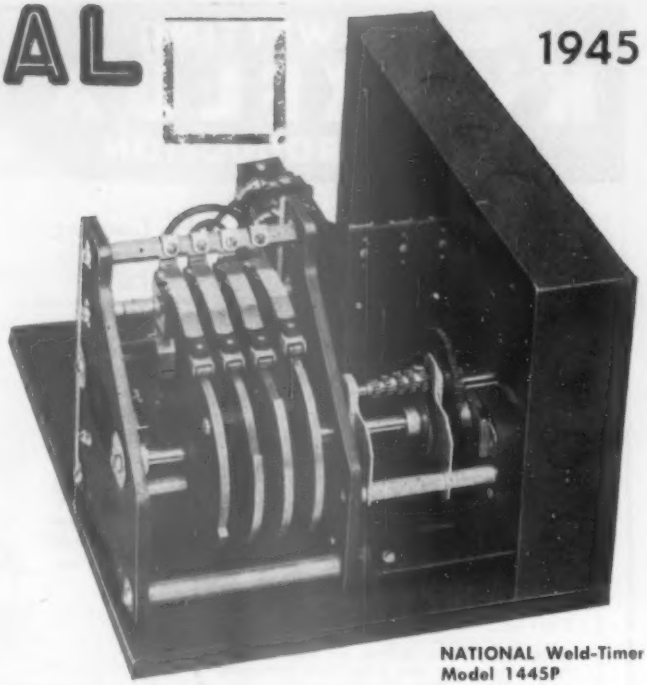


NATIONAL

PROGRESS IN WELD-TIMERS

1945

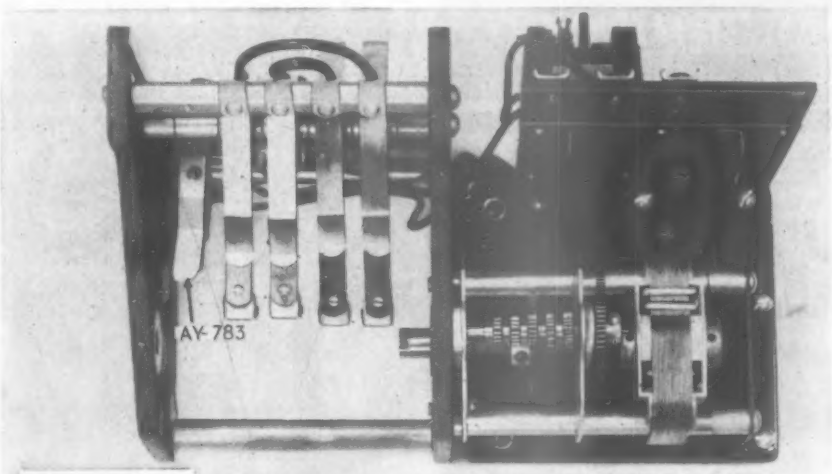


NATIONAL Weld-Timer Model 1445P

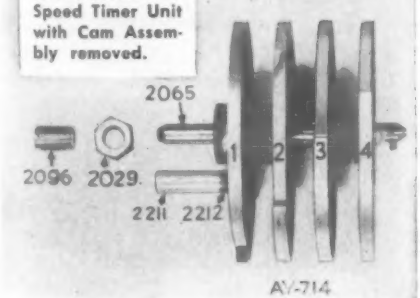
IN 1937, just one Cam per circuit, using lobes . . . We discovered, by trial and error, that this method was inadequate, too inconsistent, too many variables. Our engineers went to work seeking a better method . . . In 1939, NATIONAL announced its New patented Two-Cam-per-Circuit Time-Control method of Drop-to-Make off one Cam, followed by Drop-to-break off its companion Cam with the 2 contacts series connected. Thousands of Timers employing this principle have been delivered to Industry since then, and they are still performing as expected.

NATIONAL adds another important chapter in Better Controls for 1945. There is no change in the 2 Cam per Circuit operation. *That feature is still* the best on the Market. But—added to this, comes refinement-rigidity—quick dismantling—interchangeability. These features have been incorporated primarily to satisfy the men who have been using NATIONAL Timers for many years.

ILLUSTRATED at lower left is a partial-exploded view of a NATIONAL *5* speed Timer Unit. The Cam assembly has been moved out—accomplished by backing off screw No. 2096. Timer may be readily converted from Single Spot to Interrupted Weld Timer, by merely exchanging Cam Assembly. Motor and gear train is held in place by 2 screws at extreme right, contact pillar (under rocker arm) is accessible for point cleaning with cams removed . . . Rocker arms and springs above may be readily removed when needed to replace contacts,—one of the few expendable parts. This is a timer made to order for the Maintenance Department, which always worries about 'Down Time', and insists on equipment that its men know they can put back on the line with no delay, and no fuss . . . That is just one reason NATIONAL has sold more Weld-Timers than any other Manufacturer in the past, and expects to retain that User-Acceptance in Post War Production.

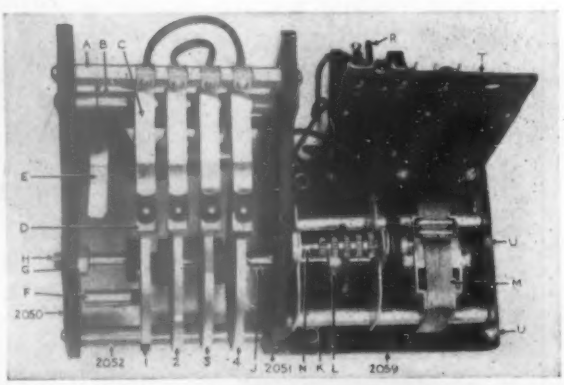


NATIONAL 5-Speed Timer Unit with Cam Assembly removed.



Left—Note the simplicity of the patented NATIONAL Cam Assembly—easily moved out, or firmly held in place, by one screw.

Right—NATIONAL Weld-Timer Unit assembled back together.



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NATIONAL—THE NATION'S CHOICE!

NATIONAL TIME & SIGNAL CORPORATION

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SUPER—WETTING
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Fast Flowing . . . No Lumping or Pitting of Solder
MEETS ALL RIGID SPECIFICATIONS

KWIKFLUX accomplishes 25% to 50% higher wetting action than the fluxes now on the market, and has almost 100% higher penetration in deep joints. It works perfectly with direct gas flame, hydrogen, acetylene —Muffle (direct or indirect) and induction heating. KWIKFLUX is used for brazing, hard soldering and welding of Stainless Steel, Iron, Copper, Brass, Bronze, Platinum, Gold, Silver, Monel Metal, Nickel, German Silver and other ferrous or non-ferrous metals and alloys. It will not blacken brass or copper, and is suited to either automatic or manual operations. Fast, efficient action assures improved quality and finish.

OUR NEW 1945 PRICE SCHEDULE PLACES KWIKFLUX ON AN ALL-INCLUSIVE COMPETITIVE BASIS

Advantages:
(1) Perfect with both Low and High Melting Point Hard Solders.
(2) Excess Flux washes off clear in hot water —saves cleaning and finishing time.
(3) Does not lump or pit solder. Forms smooth film easily washed off, leaving surface beneath bright and shiny.
(4) Faster, Fluxing Actions—saves time, gas and electricity.
(5) Fumes are fixed because KWIKFLUX is neutral. Increases production efficiency.

SEND FOR FREE TRIAL JAR

For more than 12 years, our tested research improvements have been passed on to our customers. This service has been in operation during the war period.

TESTED AND PROVEN BY PROMINENT USER OF FLUXES
"KWIKFLUX has proven far superior to other fluxes due to the ease with which the excess material may be removed after brazing, that it is also necessary to use very much less quantity, and that it is much easier on the eyes, throat and hands." (Name on request)

KWIKFLUX

WRITE FOR LITERATURE
Data sheets describing KWIKFLUX in detail — advantages, properties, characteristics and price—will be sent promptly on request. There is no obligation.

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for welding of aluminum

ELECTRIC and GAS WELDING
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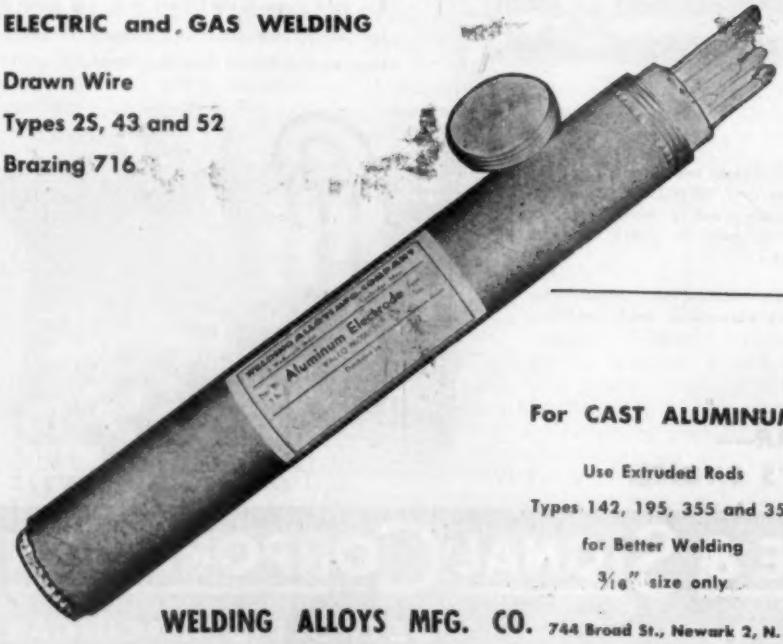
Types 25, 43 and 52
Brazing 716



For CAST ALUMINUM
Use Extruded Rods
Types 142, 195, 355 and 356
for Better Welding
3/16" size only

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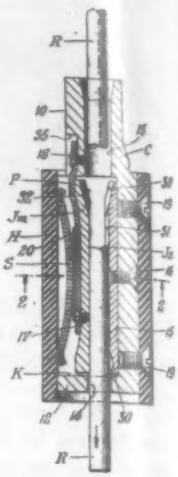
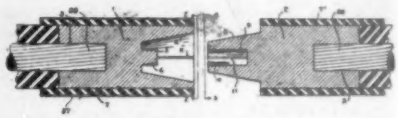
Automatic Welding Head



2,379,470. **Albert W. Baird**, Cranford, N. J., assigned to **The Linde Air Products Co.** Filed Dec. 23, 1943. Issued July 3, 1945.

Automatic welding apparatus including a rod guide and contact jaw assembly. The latter comprises a tubular member of conducting material having at one end a stem provided with a rod entrance passage and a collar at the other end provided with a rod exit passage. The tubular member has a medial laterally opening cavity of rectangular cross-section. A long stationary contact jaw is disposed within and fits against the three longitudinal walls of this cavity, the center of the jaw being secured to the bottom wall. This jaw has a concave rod-contacting surface and bevelled end surfaces. A long movable jaw is suspended within the cavity for floating movement toward and away from the stationary jaw. The movable jaw has a flat rod-contacting face and a bevelled surface at the rod-entrance end. A flat flexible pigtail conductor is connected to the stem above the cavity and connected at its other end to the back of the movable jaw to support it in suspension. A strip of insulation is disposed over the flat conductor in the area of the center of the movable jaw, and an arcuate leaf spring bears against this strip. An insulating case fits around the tubular member and covers the cavity so that the opposite ends of the spring bear against the inner side of the case.

» «



Cable Connector

3,379,424. **Roy W. Clinkscale**, Vallejo, Calif., and **Wesley McL. Hague** and **Evander W. Sylvester**, United States Navy. Filed, Dec. 18, 1941. Issued July 3, 1945.

A detachable two-part cable connector. One end of the first part has a recess having a conical surface and an axially positioned stud therein having male interrupted threads. The corresponding end of the second part has an external conical surface and an axially extending recess having female interrupted threads. When the external conical surface of the second part enters into the conical recess of the first part, the male interrupted threads on the stud of the first part are in position for engagement with the female interrupted threads in the recess of the second part. The connector parts may then be tightly joined by a slight rotation of the parts.

See THIS FIXTURE FOR AUTOMATIC WELDING!

A BIG TIME SAVER!

THIS Acme dual fixture arrangement permits practically constant use of an automatic welding head, because one of the fixtures can be reloaded while the other is engaged in the welding operation.

The holding machine can be set to revolve at any angle from vertical to horizontal. (Illustration shows a wheel being welded at 45° angle.) Positioner arm swings from one fixture to the other, locking in proper position. Speed of rotating the work is adjustable, as desired.

WRITE
for information relating to your particular welding fixture problem

Reloading Is Done During Welding Operation

Automatic Welding-head Positioner — adaptable to your own holding fixture.

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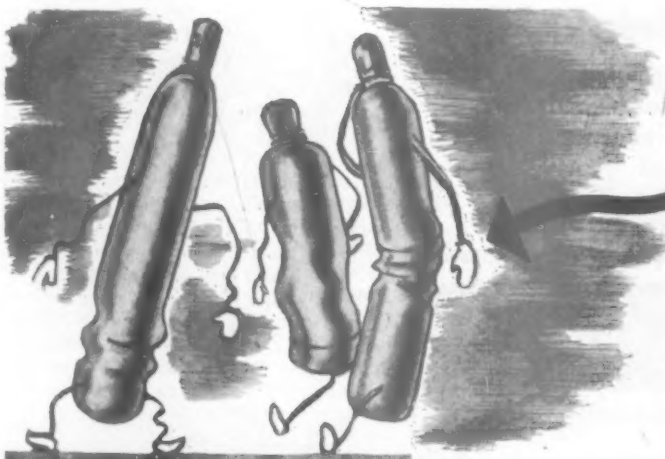

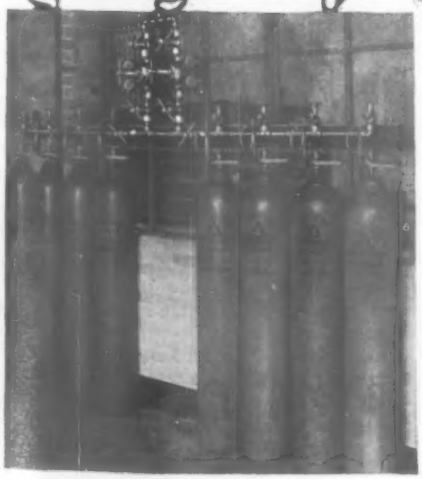

Does YOUR SHOP HAVE CYLINDER-ITIS?

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If your shop is troubled with cylinder-itis investigate the time and money-saving advantages of a modern RegO Manifold . . . there's no obligation . . . write today!

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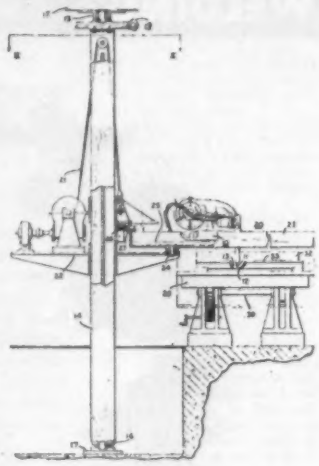
for development, design, layout and detailing of special and experimental industrial machinery. Men with creative ability preferred, experienced in electrical, hydraulic and pneumatic application. Only persons with well-founded practical experience should apply. Permanent positions with good salaries and opportunities for advancement in a growing organization are possible for those who qualify. All replies confidential. Address J. F. Joy, Vice-President-Eng'g. The Federal Machine & Welder Company, Warren, Ohio.

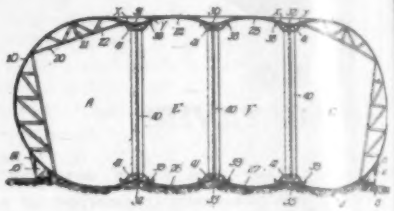
Automatic Welding Apparatus

2,379,531. **John Lippart,** Prospect Park, Pa., assigned to **Westinghouse Electric Corp.,** East Pittsburgh. Filed Sept. 27, 1943. Issued July 3, 1945.



An apparatus for supporting a traversable automatic welding head including a vertical column, a support guided for vertical movement by the column, a cantilever arm carried by the support and pivotally connected to it about an axis vertical and parallel to the column axis. The welding unit travels along a guideway formed in the cantilever arm. Gearing connecting the support and the arm causes the latter to move relative to the support about the axis of the pivotal connection. The gearing includes a manually operable driving gear carried by the support, means for raising and lowering the support along the column and means providing for adjustment of the column about its vertical axis.

» «



Welded Pressure Tank

2,380,089. **Reign C. Ulm,** East Chicago, Ind., assigned to **Graver Tank & Mfg. Co., Inc.,** East Chicago. Filed Dec. 13, 1943. Issued July 10, 1945.

A closed container formed of circular surfaces including spherical portions forming the corners, horizontal cylindrical sections forming the tank sides and at least one horizontal cylindrical segment comprising the center of the tank. Inwardly curved connecting surfaces join the center cylindrical segment with the parallel sections forming the tank sides. Supporting girders are located at the junctions of the center segment with the parallel sections and are disposed on the respective sides of each inwardly curved surface. Posts extending vertically of the tank connect the roof and bottom girders.

» «

Steel Alloy

2,378,437. **Dr. Byramji D. Saklatwalla** (deceased) assigned to **Alloys Development Co.,** Pittsburgh. Issued June 19, 1945.

This patent covers a high-strength, corrosion-resistant steel possessing ductility, toughness and good welding properties. It contains essentially: carbon 0.14% max., manganese 0.50% max., phosphorus 0.07-0.18%, chromium 0.25-1.5%, nickel 0.25-1.5%, molybdenum 0.07-0.60%, copper 0.18-0.75%. The steel, being low in carbon and manganese, promises to provide an effective outlet for "tri-alloy" scrap in the form of a structural steel suitable for welding.

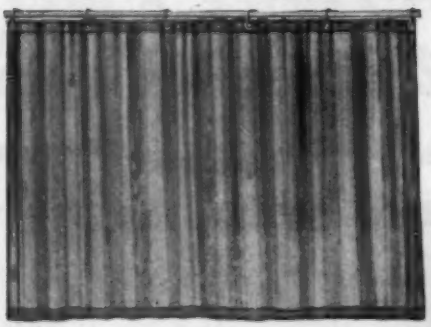
» «

Acetylene Removal

2,379,670. **Charles E. Welling** and **Harold J. Hepp,** Bartlesville, Okla., assigned to **Phillips Petroleum Co.** Filed Jan. 24, 1942. Issued July 3, 1945.

A process for treating a gaseous mixture of olefins, free hydrogen and a minor amount of acetylene in order to hydrogenate the acetylene without appreciable hydrogenation of the olefins. The mixture is passed at a temperature between 100 and 400 C under a superatmospheric pressure into contact with a large steel surface for a time sufficient to effect substantially complete removal of the acetylene. The steel of the surface contains between 16 and 25% chromium and not more than 12% nickel.

"SAF-T" CURTAINS for Industrial Uses



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Any size required.
Equipped with grommets ready to hang.
Color: Olive Drab.
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Write for prices and descriptive material.

Irreplaceable Parts CAN BE SALVAGED with YORK'S 77 CAST IRON BRAZING FLUX

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May. 30, /45

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Seneca
Kansas

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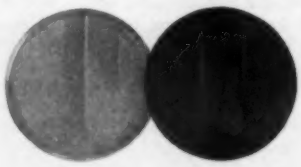

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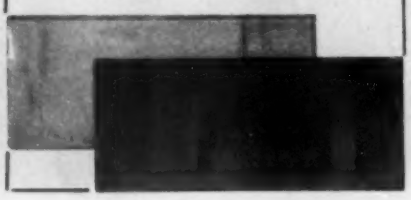
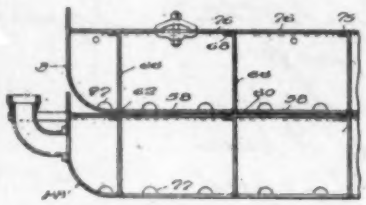


Spot-Welding Electrode

2,379,187. **Glenn G. Richards,** Forest Hills, Pa., assigned to **Westinghouse Electric Corp.,** East Pittsburgh. Filed Dec. 11, 1943. Issued June 26, 1945.

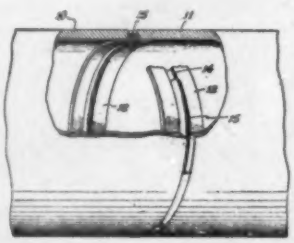
A spot-welding electrode having a tip of a relatively high-resistance material and numerous holes for air cooling. Because of the holes, the distributed contact surface is of substantially less area than the cross-sectional area of the tip at the surface, thereby concentrating the flow of heat from the tip to the work at predetermined locations.



Welded Ship Hull

2,379,259. **Richard F. Smith,** Savannah, Ga. Filed Oct. 23, 1941. Issued June 26, 1945.

A method of constructing a welded hull by providing a floating pontoon structure having a plurality of spacer bars secured in predetermined relation to its upper surface. A plurality of bottom shell plates, of greater thickness than the height of the spacer bars, are set between the bars, and a plurality of framing elements are set on the tops of the bars and between adjacent shell plates. The framing elements are welded to adjacent pairs of shell plates at the upper portions of the latter. After the hull has been sealed and is capable of floating, the pontoon structure is removed by progressively sinking it. The bottom of the sealed hull is then turned uppermost while it is floating, and the bottom shell plates and framing elements are automatically welded together in the space provided by removal of the spacer bars.



Back-up Rings

2,380,071. **Earl C. Planett,** Downey, Calif. Filed April 3, 1943. Issued July 10, 1945.

A heat transmitting and radiating welding band for pipe joints. It comprises a flat, circular band having a groove in its exterior surface and a ring of fusible metal and of a diameter considerably less than the width of the band. Ring is mounted circumferentially and centrally of the band and nests in the groove formed in the latter. The ends of both band and ring are spaced apart.

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